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ABSTRACT

The two purposes of this report are to present concrete proposals related to the need for the National Library of Canada to facilitate the development of nationwide bibliographic and associated communications networks, and to outline the relevant network concepts assumed in framing the nine recommendations and the related implementation proposals that are presented. These proposals are intended to serve as an early practical step towards a wider and more complete nationwide library and information network in the longer term. Notes and references are provided for the three major chapters, as well as an implementation chart with timelines and a network flowchart. Discussion of long term trends and needs for Canadian library and information networking and notes on European and U. S. arrangements to promote nationwide and community-wide networking are appended. (Author/RAA)

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Final report of the
Canadian Computerized
Bibliographic Centre Study

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TOWARDS MORE EFFECTIVE NATIONWIDE LIBRARY AND INFORMATION NETWORKING IN CANADA

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FOREWORD

This is the final report of the Canadian Computerized Bibliographic Centre Study. Following its inception in 1976, the Study produced seven substudy reports together with a background paper summarizing the substudy reports. These reports are listed in section 1.2 of the text.

I wish to express my appreciation for this report to its principal author, Mr. Roderick M. Duchesne, to his principal assistants, Ms. Doreen Guenter and Dr. Mazharul Islam, as well as to all others who have contributed comments and suggestions during its preparation.

The present report supplements the recently published report entitled The future of the National Library of Canada by describing in greater detail proposed National Library programs relating to computerized library network development in Canada. The implementation of these projected programs is subject to the availability of resources, and to the positive response of other institutions as appropriate, both within the federal government and elsewhere. It also develops further the concept of a Canadian computerized library and information network in the shorter and longer terms. I very much hope that all interested parties will make their reactions known to us so that we can collectively develop a plan which would be supported and implemented in cooperation.

Guy Sylvestre
National Librarian

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B. Notes on European and US arrangements to promote nationwide and community-wide networking.

EXECUTIVE SUMMARY

The Canadian Computerized Bibliographic Centre Study (CCBCS) was undertaken by the National Library of Canada "to review the present situation concerning computerized bibliographic centres in Canada and to report ... on the most effective means of promoting desirable Canadian computerized library network development ..." To arrive at an assessment of the Canadian situation, seven sub-studies were conducted. The findings and conclusions of these substudies have been summarized in a background paper.

The present document is the final report of the Study. It supplements the recently published report entitled The future of the National Library of Canada by proposing National Library programs relating to computerized library network development in Canada. It also develops further the concept of a Canadian computerized library and information network, in the shorter and longer terms.

Part I : Proposals for action (pp. 4-34)

The recommendations of the report relate directly to the principal program objective of the National Library of Canada and also reflect, at the same time, major federal concerns in the area of information. The principal program objective of the National Library is "to facilitate the use of the library resources of the country by the Government and the people of Canada". In addition, the National Librarian has responsibility for providing the National Research Council with general direction in the development of a national scientific and technical information system.

The promotion of an effective nationwide library and information system accords with the thrust of the findings and recommendations of many studies, briefs, and reports. An effective nationwide library and information system can assist the attainment of a number of federal government objectives: support of Canada's employment and balance of payments; increased efficiency of research and development in Canada and of Canadian industry; improved support of planning and decision making by parliament and government; better supply of information for social groups and individual citizens. But such a system will not develop without federal initiative because the federal government itself holds a considerable proportion of national-level network resources; because information resources both within the federal government and outside are fragmented and dispersed; and finally because there is insufficient incentive for sufficient private sector investment in information system development for the next 10-15 year period.

The need to promote an effective nationwide library and information system is recognized nationally and internationally. The majority of developed countries have active and ongoing programs directed to this end. These types of development are also promoted by Unesco. The recommendations in this part of the report form the basis of a program directed towards a more effective Canadian nationwide library and information system, with special reference to computerized library network development.

There are nine recommendations in all. The 1st (pp. 7-9) and 2nd (pp. 9-11) recommendations deal respectively with the approach and the priority in implementing a program package aimed at promoting a nationwide library and information network; it is recommended that within a comprehensive plan priority should continue to be given to practical programs and projects yielding direct benefits and results within an early time period.

The principal action proposal of the report is outlined in Recommendation 3 (pp. 11-14). This recommendation proposes that the National Library of Canada implement an on-line interconnection program directed towards making library and information resources more accessible to Canadians. Early phases in this program should include:

a) Further development of the National Library data base policies and plans;

b) Creation and mounting of an inventory of available data bases;

c) Pilot projects directed towards improved data exchange;

d) Improved facilities for document location and ordering of loans/copies.

Later phases should include:

e) Expansion of the proposed inventory of data bases to provide a network master index/directory and associated referral services;

f) Improved interfacing and switching between information retrieval and library processing facilities;

g) Progressive implementation of computer-to-computer links.

In Recommendation 4 (pp. 14-15), it is proposed that the Federal Government of Canada provide network promotional funds through a unified program to encourage and facilitate network development; that such funds be made available either through the National

Library of Canada on the advice of a committee on which federal granting agencies would be represented, or through the granting councils on the advice of a joint committee on which the National Library would be represented. Recommendation 5 (pp. 15-17) proposes that the National Library call a series of meetings and/or set up working groups, as appropriate, with a view to addressing priority networking issues and concerns and to establishing appropriate organizational, working, and liaison arrangments. Recommendation 6 (p. 18) proposes that the National Library embark on an expanded network liaison and publicity program directed towards increased nationwide dialog and communication concerning network issues, needs, developments, programs and opportunities. Recommendation 7 (pp. 19-20) proposes that the National Library maintain a continuing program to monitor and evaluate technical and other trends and developments relevant to the needs of Canadian libraries and their users. Recommendation 8 (pp. 20-21) endorses the National Library's current programs directed towards developing a machine readable Canadian national bibliographic data base meeting the particular needs of Canadian libraries and proposes extension of these programs. Extensions will be needed to promote the accessibility of machine readable data at all the nodes in the nationwide computerized library network and to facilitate the flow and use of the data. The ninth and last recommendation (pp. 21-22) endorses the National Library's current activities in the standards area and proposes that the National Library's standards program be of an on-going nature and flexible enough to meet current priorities and needs.

Chapter 3 (pp. 26-34) of the report draws together into a summary the principal early tasks associated with each of the recommendations in Chapter 2. This summary is in the form of a table and an implementation chart. The table lists the tasks associated with each recommendation; it also shows proposed start and finish years.

Part II : Network concepts (pp. 35-55)

The purposes of this part of the report are to outline nationwide network concepts assumed in framing the recommendations in Part I and to indicate that the proposals in Part I are an early practical step towards a wider and more complete nationwide library and information network. The concept of a nationwide network to be promoted in the shorter term is already outlined in two documents: The Canadian Union Catalogue Task Group report, 1976 and The future of the National Library of Canada, 1979. The principal relevant statements of these two documents concerning network concepts and objectives are brought together in Chapter 4.

The final report of the Union Catalogue Task Group outlined the concept of a Canadian Library Network comprising three subnetworks: a bibliographic network, a resource network, and a communications network. Relevant quotations from the Task Group report are included in subsection 4.2.1. The objectives and function of a nationwide network are described in greater detail in The future of the National Library of Canada report which builds upon the concepts of the Union Catalogue Task Group and employs the same subnetwork concepts. Relevant quotations from The future of the National Library of Canada report are included in subsection 4.2.2. In that report the central or national level functions of a nationwide network are described as:

1. overall network planning and liaison;
2. development and promotion of standards;
3. coordination of interface with international network nodes;
4. national data base authentication;
5. provision of bibliographic records for current and retrospective Canadian materials, and provision of records from foreign sources in the Canadian MARC format;
6. funding for research and development and network studies;
7. development of protocols for computer-to-computer links;
8. provision of nationwide lending and location services;
9. collection development funding for resource and back-up libraries;
10. conservation/preservation plan and services.

Section 4.3 notes that the Background Paper of the Study provides a description of the Canadian Computerized Library Network as it existed in 1977. The section provides a definition of the nationwide computerized library network and a list of the functions which will be performed within this network. This network will be in effect a network of networks. This network of networks will interconnect existing and emerging networks which may be specialized (for instance, cataloguing, interlibrary loan, reference information, etc.).

Section 5.2 outlines the likely form of the future nationwide library and information network from a user point of view. Terminal devices will be the principal means for access to network resources and services supported by extensive data networks, dial-up and leased telephone lines. Users seeking network services but not knowing where to go will be able to access a master index/directory to network resources and services. Thanks to increasing interconnection, standardization and automatic switching facilities, users will be able to perform searches on multiple information retrieval centres, store relevant literature references so obtained, then search location data bases and place electronic orders for documents or document images, for tele-copies (electronically transmitted copies printed at user location), etc.

As the electronic revolution advances and computer terminals enter the mass market, library and information oriented networks will become progressively integrated into the larger world of electronic communication. In such an environment it will be irrelevant to maintain any rigid distinction between library services and information services. In Appendix A, these ideas are explored in some detail. Finally, the relevance of the proposals put forward in Part I of this report to the nationwide network in the longer term is reviewed in Section 5.3. It shows that the proposals are entirely compatible with longer term development trends and can be seen as an early practical step to promote desirable network development. The relevance of more general proposals (e.g. concerning funding, standards) is evident; Section 5.3 illustrates how the proposed on-line interconnection program could be developed to provide improved network index/directory facilities and increased interface and switching capabilities.

Appendices

Two appendices are provided to supplement the text of the report. Appendix A reviews some long term trends and needs relating to the growth of the information sector, growth of electronically stored information, move towards mass remote access to on-line information services, the growing problems of traditional libraries, and, finally, Canadian information service needs and capabilities. Appendix B provides some notes on networking arrangements in selected European countries and in the United States. The emphasis is more on identifying the existence of a nationwide library and information network concept and mechanisms used to develop and administer network programs than on any comparison of expenditures on networking in these countries.

RECOMMENDATIONS

Recommendation 1 : The need for a comprehensive promotional program (pp. 7-9)

In promoting an effective nationwide library and information system, the National Library of Canada - in cooperation with other agencies as appropriate - should implement a comprehensive program addressing all aspects with a major influence on the performance of the system.

The program should include promotion of the following:

a) Bibliographic information services; reference, factual, and referral information services; document supply services; and communications facilities to provide access to these services.

b) More general arrangements for the promotion of nationwide network development.

Recommendation 2 : Priorities for a promotional program (pp. 9-11)

In implementing a program to promote a Canadian nationwide library and information system, priority should continue to be given to practical programs and projects. These programs and projects should be designed to yield direct benefits and results within an early time period; they should also act as building blocks within a longer term more overall network approach and strategy.

Organizational, governance, funding, and liaison concerns will initially be dealt with most effectively in a manner linking very closely with programs rather than as subjects to be addressed as topics in their own right.

Recommendation 3 : An on-line interconnection program (pp. 11-14)

The National Library of Canada should implement an on-line interconnection program directed towards making library and information resources more accessible to Canadians. Early phases in this program should include:

a) Further development of National Library data base policies and plans;

b) Creation and mounting of an inventory of available data bases;

c) Pilot projects directed towards improved data exchange;

d) Improved facilities for document location and ordering of loans/copies.

Later phases should include:

e) Expansion of the proposed inventory of data bases to provide a network master index/directory and associated referral service;

f) Improved interfacing and switching between information retrieval and library processing facilities;

g) Progressive implementation of computer-to-computer links.

Recommendation 4 : Network promotional funds (pp. 14-15)

The federal government of Canada should provide library and information network promotional funds through a unified program to encourage and facilitate network development through the implementation of cooperative schemes. To arrive at the final implementation of these schemes, funds may be required to support a variety of activities including pilot projects, studies, research, liaison, education, training, publicity and temporary operating subsidies.

These funds should be made available either through the National Library of Canada on the advice of a committee on which the federal granting agencies would be represented, or through the granting councils on the advice of a joint committee on which the National Library would be represented.

Recommendation 5 : Canadian library and information networking meetings (pp. 15-17)

The National Library of Canada should call library and information network meetings and/or set up working groups, as appropriate, with a view to:

a) Agreeing on action programs to address priority networking concerns and issues;

b) Establishing satisfactory organizational, working and liaison arrangements concerning these action programs;

c) Establishing suitable organizational mechanisms to address nationwide library and information networking concerns and issues.

Recommendation 6 : Network liaison and publicity (p. 18)

The National Library of Canada should embark on an expanded network liaison and publicity program directed towards increased nationwide dialogue and communication concerning network issues, needs, developments, programs and opportunities. This expanded program should include:

(a) Improved network newsletter arrangements

At present National Library reporting is essentially uni-directional: reporting on National Library activities and plans. This reporting should be made multi-directional: reporting on activities and developments nationwide and (where relevant to Canada) abroad.

(b) Regular reporting of National Library forward plans

In order to provide leadership, the National Library must regularly publicize its forward plans and policies. Reports of forward plans should be publicized at least once a year. Convenient reporting times can be chosen to link with the federal budgetary cycle, e.g. the acceptance of the program forecast for the forecast period.

(c) Meetings, conferences, workshops

The National Library should be more visible in national and regional functions relevant to networking concerns. Where appropriate, the National Library should sponsor or contribute to the costs of functions. In many cases it is not realistic to expect individuals or local, provincial and regional institutions to bear the costs of nationwide networking discussions.

Recommendation 7 : Network trends, developments and needs (pp. 19-20)

The National Library of Canada should maintain a continuing program to monitor and evaluate technical, economic and political trends and developments relevant to the needs of Canadian libraries and their users.

Recommendation 8 : Canadian national bibliographic data base (pp. 20-21)

The National Library of Canada should continue and extend its present programs directed towards developing a machine readable Canadian national bibliographic data base meeting the particular

needs of Canadian libraries. Extension of the programs will be needed to promote the accessibility of machine readable data existing at all the nodes in the nationwide computerized library network, and to facilitate the flow and use of the data.

Recommendation 9 : Network standards and guidelines (pp. 21-22)

The National Library of Canada should continue its present program for the development of standards and guidelines facilitating nationwide library and information network development. In view of the rapid rate of change in the library and information field, this program must be of an on-going nature and must be flexible enough to meet current priorities and needs.

1. INTRODUCTION

1.1 What this report seeks to do

This is the main report of the Canadian Computerized Bibliographic Centre Study (CCBCS) and has two main purposes:

a) To present concrete proposals

In accordance with the terms of reference of the Study (quoted in section 1.2 below), the proposals relate to the need for the National Library to facilitate the development of nationwide bibliographic and associated communications networks. Part I of the report presents recommendations and implementation proposals.

b) To outline relevant network concepts

Part II outlines network concepts assumed in framing the recommendations presented in Part I. Part II also indicates that the proposals in Part I are an early practical step towards a wider and more complete nationwide library and information network in the longer term.

1.2 Background

The Canadian Computerized Bibliographic Centre Study (CCBCS) was undertaken by the National Library in response to the recommendation of "The informal seminar on bibliographic centres in a Canadian library network" held at NLC on May 5 and 6, 1975 and attended by delegates from 19 organizations concerned with library and information network development in Canada. All regions of Canada were represented at the seminar. There were also representatives of most types of library, of the most concerned federal and provincial government agencies, and of the principal professional associations. Further details on the background to the CCBCS and its terms of reference are provided in Overview of computerized library networking in Canada, the background paper of the CCBCS main report.

The principal terms of reference of the CCBCS were:

"to review the present situation concerning computerized bibliographic centres in Canada and to report ... on the most effective means of promoting desirable Canadian computerized library network development, including the development of a cooperative national union catalogue/ national bibliographic data base system ..."

In view of the scope of the study and the magnitude of the task involved, the study was conducted in the form of seven substudies over a period of about two and a half years from mid-1976 to early 1979. The seven substudies are:

A1 : Computerized bibliographic centres (4 volumes, 289 p.)

A2 : National location service planning in an evolving Canadian computerized library network (131 p.)

A3 : Incompatibilities among on-line computerized bibliographic systems (3 volumes, 224 p.)

B1 : Funding for Canadian information and library network development (35 p.)

B2 : Library networking in Canada: The principal federal and provincial government agencies concerned (31 p.)

B3 : Library networking in Canada: Principal relevant committees and associations (62 p.)

C1 : Externally submitted papers and views (48 p.)

These substudy reports are summarized in the background paper entitled Overview of computerized library networking in Canada.

1.3 Principal other documents to be considered in conjunction with this report

This report should be read with specific reference to three other documents:

a) Canadian Union Catalogue Task Group. Final report to the National Librarian of Canada, 1976. Ottawa, Minister of Supply and Services Canada, 1976. 86 p.

b) Overview of computerized library networking in Canada. Ottawa, National Library of Canada, 1979. 53 p.; 33 p. of appendices

c) The future of the National Library of Canada. Ottawa, Minister of Supply and Services Canada, 1979. 88 p.

The report of the Canadian Union Catalogue Task Group describes the general Canadian library network situation in 1975/76. The Overview ... report focuses on a number of computerized library networking and organizational and funding aspects (as of 1977/78) not covered in any detail by the Task Group report.

The future of the National Library of Canada report provides an overview of proposed National Library programs. Of particular relevance to the present document, the above report:

a) identifies the further development of the nationwide bibliographic and communications network as the highest priority area within the National Library's network plan. The present document relates to this area;

b) elaborates a comprehensive approach to nationwide networking, including not only bibliographic and communications programs, but also programs relating to document provision and supply (the resources network), to Canadian studies and conservation, and to relevant federal level organizational arrangements.

PART I:

PROPOSALS FOR ACTION

CHAPTER 2: WHAT NEEDS TO BE DONE

2.1 The promotion of a more effective Canadian nationwide library and information system

The principal program objective of the National Library is "to facilitate the use of the library resources of the country by the Government and people of Canada".[1] This program objective commits the Library to seek to promote an effective nationwide library and information system. Section 8 of the National Library Act reinforces this program objective by empowering the National Librarian to ".... on terms and conditions approved by the Minister, enter into agreements with libraries and library and educational associations in and outside Canada in respect of library services ...". Every major service program of the National Library is directed towards the creation of an effective nationwide library system. Major examples of National Library programs with this orientation include:

* Canadian Union Catalogue and interlibrary loan programs
* National bibliography prcgrams
* NLC library systems development programs (e.g. DOBIS[2] software, data base and service developments)
* Resources surveys

By cabinet directive[3], the National Librarian has responsibility for providing general direction to the National Research Council in the fulfilment of its mandate to develop a national scientific and technical information system[4].

The promotion of an effective nationwide library and information system accords with the thrust of the findings and recommendations of many studies, briefs, and reports. Examples of studies, reports and briefs are listed below[5-10]. Briefs include the 33 briefs received by the National Library in the course of the review of its role, completed in 1979.

An effective nationwide library and information system can assist the attainment of a number of federal government objectives:

a) Support of Canada's balance of payments and employment as noted in Appendix A, section 6.

b) Increased efficiency of research and development in Canada and of Canadian industry, as noted in Appendix A, section 6.

c) Improved support of planning and decision-making by parliament and government.

d) Better supply of information for social groups and individual citizens, helping to improve their quality of life and cultural contributions.

Additional reasons why federal government promotion of network development is desirable include:

a) A considerable proportion of national-level library and information network resources (data bases, collections, services) are maintained by the federal government and its agencies.

b) There is a strong tendency for a series of divisions to restrict user access to total nationwide network resources. The divisions usually correspond to jurisdictional boundaries which in some cases correspond with form of institution (library, museum, archive, etc.). In other cases, the divisions correspond with subject areas (medicine, chemistry, etc.); and in some other cases, they correspond with political boundaries (e.g. of Provinces). This listing is not exhaustive and combinations of the divisions noted also occur. The major point is that these divisions will tend to persist and to restrict user access to total nationwide resources: a nationwide interlinked network needs federal promotion to come into existence.

c) As noted in Appendix A, section 6, it will probably take 10 to 15 years more for Canada to reach the point when significant private sector investment in the information industry becomes attractive: federal promotion of the network will be needed especially during this period.

The need to promote an effective nationwide library and information system is widely recognized nationally and internationally. The majority of advanced countries have active and on-going programs directed to this end. For example, there are on-going programs, in West Germany, USA, France, Britain, Sweden, Australia, USSR and Japan[11-17]. In addition, Unesco seeks to promote the further development and interfacing of national library and information systems through its General Information Program.

While the need for an effective nationwide library and information system is great and widely recognized, the task of building this system is huge. The future of the National Library of Canada[18] report expressed this in the following terms:

> "A nationwide bibliographic network will not happen by miracle, any more than did the CPR, CNR, Air Canada or the CBC. It will not happen without much planning, cooperation, labour and money. All four are indispensable".

The recommendations in this chapter form the basis of a program directed towards a more effective Canadian nationwide library and information system, with special reference to computerized library network development.

2.2 Approach

The findings of the CCBCS endorse the comprehensive approach to national-level networking embodied in the National Librarian's The future of the National Library of Canada report.

A comprehensive approach includes the support of aspects relating to bibliographic information; reference, factual and referral information; document supply; and communications facilities (electronic, mail, courier, etc.) to provide access to the above services. These services also need to be supported by arrangements relating to funding, organization, and standards.

There are important reasons for the National Library to adopt a broad and comprehensive approach to library and information systems networking in Canada. By giving the National Librarian the responsibility to provide NRC with general direction in the development of a national scientific and technical information system[18], the federal government has clearly indicated the National Library's national role extends over the entire field of library and information services. Furthermore, only a broad and comprehensive approach will enable the National Library to address federal concerns adequately. The federal government's direct concerns are with information and related issues (e.g. freedom of information, protection of privacy, provision of information for Canadian business and industry, the Canadian information industry) as they affect the economic and social well-being of Canadians.

Nationwide promotion of library and information networks cannot remain focused solely on bibliographic information or document supply. A high proportion of users seek literature references and documents only in order to use these to obtain

factual data or information. It is counter-productive to produce "electronic super-highways" to the references to documents if the documents cited cannot be made available, or can be made available only with considerable delay, uncertainty and cost. It is also impractical to limit nationwide system promotion to aspects concerned with electronically recorded information. While a growing proportion of information is being recorded in electronic form, the proportion of recorded information in this form is still very small.

National Library initiatives in the shorter term (i.e. the next five years) are concentrating on improved bibliographic and document supply services. As noted in the National Librarian's The future of the National Library of Canada report, National Library plans, in the next five years to concentrate on developing further the following national level functions:

"1. overall network planning and liaison;

2. development and promotion of standards;

3. coordination of interface with international network nodes;

4. national data base authentication;

5. provision of bibliographic records for current and retrospective Canadian materials, and provision of records from foreign sources in the Canadian MARC format;

6. funding for research and development and network studies;

7. development of protocols for computer-to-computer links;

8. provision of nationwide lending and location services;

9. collection development funding for resource and back-up libraries;

10. conservation/preservation plan and services."[19]

In the longer term, further initiatives will be required to meet substantial and cumulative changes in the overall library and information environment. In this context, more emphasis will be placed on the provision of general and subject-specialized directory-type data bases and numeric and fact data bases. The provision of these expanded services to the

user will also be assisted by falling computer and communication costs and by the inherent advantages of using electronic processing and communications (i.e. remote access, fast response, and ability to process high volumes of data and transactions); the private sector will have an increasing part to play in the provision of these services. Chapter 5 provides some pointers concerning library and information network development in the longer term.

The proposed approach to the promotion of an effective nationwide library and information system is summarized in the following recommendation:

RECOMMENDATION 1 : THE NEED FOR A COMPREHENSIVE PROMOTIONAL PROGRAM

IN PROMOTING AN EFFECTIVE NATIONWIDE LIBRARY AND INFORMATION SYSTEM, THE NATIONAL LIBRARY OF CANADA - IN COOPERATION WITH OTHER AGENCIES AS APPROPRIATE - SHOULD IMPLEMENT A COMPREHENSIVE PROGRAM ADDRESSING ALL ASPECTS WITH A MAJOR INFLUENCE ON THE PERFORMANCE OF THE SYSTEM.

THE PROGRAM SHOULD INCLUDE PROMOTION OF THE FOLLOWING:

A) BIBLIOGRAPHIC INFORMATION SERVICES; REFERENCE, FACTUAL, AND REFERRAL INFORMATION SERVICES; DOCUMENT SUPPLY SERVICES; AND COMMUNICATIONS FACILITIES TO PROVIDE ACCESS TO THESE SERVICES.

B) MORE GENERAL ARRANGEMENTS FOR THE PROMOTION OF NATIONWIDE NETWORK DEVELOPMENT.

Bibliographic information services are required by libraries and document centres to create and share bibliographic records, with associated advantages in speed, quality, and economy of library processing and in permitting the provision of additional outputs and services. Reference and referral services provide referral information about the network resources available, other reference information, and factual data. Document supply services are employed by users to identify, locate, and obtain needed documents, document images, and copies. Communications facilities are used to support all the interactions between users and information/documentation/library services and between bibliographic centres. These facilities, therefore, include not only electronic forms of communication but also delivery systems such as mail, courier, and interlibrary transit van services.

In the longer term, National Library initiatives should be directed to meet changes in user demands for information and the increased use of electronic processing and communications.

More general arrangements for the promotion of nationwide network development include those aspects dealing with funding, organization (e.g. governance), standards, and relevant policy.

2.3 Priorities

While a comprehensive program is needed to promote a more effective nationwide library and information system, it is not possible to do everything at once.

A particular problem in the networking area is that organizational and governance issues are so important. Unfortunately, these issues are also very intractable, and a conclusion of Study work is that these issues will be most easily dealt with on a pragmatic basis linked very closely with well-defined programs.

There are a number of reasons why governance issues are very difficult to deal with at a general level at the present time. One reason is that the nationwide library and information network is becoming more complex, eg. decentralization of processing and of data bases; another reason is that the network is in a state of rapid change. This change extends even to the nature of, and the motivation for, networking:

> "The driving force behind networking used to be a desire to share both functions and data. As small computer systems have become more powerful, more self-contained, more complete, they have also become more independent in their function. People are now buying small machines which can solve 90% of their problems and then proceed to redefine the remaining 10% of their problems as unimportant. There has been a noticeable shift away from older network designs based on functions distributed across a hierarchy of computers with the most powerful computer at the center. Instead, in more and more designs, processing functions are redundantly located throughout the network, and internodal traffic consists of data transactions. In effect, data sharing, not function sharing, is becoming the primary network rationale."[21]

While data sharing is becoming the primary bibliographic network rationale, there is not yet consensus on the basis on which this sharing should take place:

> "It is to be noted that, whilst no library ever refused to provide catalogue cards to build the manual Canadian Union Catalogue over the last twenty-five years, many are now reluctant to have the same information stored in an on-line system accessible to others. The problem of the "ownership of records" may very well prove to be the most difficult to resolve and could be the main stumbling block in the networking of Canadian library systems."[22]

The resolution of this question is linked to another unanswered question, namely the relative importance of the public and private sectors in the network. A private sector dominated network would likely have charging for a high proportion of network transactions, while a public sector dominated network would likely involve more sharing and less emphasis on fees for transactions. The governance structure would differ considerably between these two types of networks, but the future balance between the two sectors (public and private) is difficult to forecast at this point. This balance will be determined in large part by the relative balance of resources committed to the network by each of the sectors.

Section 2.6 below proposes a basic step by step approach with respect to organizational and governance topics.

This priority choice is summarized in the following recommendation:

RECOMMENDATION 2 : PRIORITIES FOR A PROMOTIONAL PROGRAM

IN IMPLEMENTING A PROGRAM TO PROMOTE A CANADIAN NATIONWIDE LIBRARY AND INFORMATION SYSTEM, PRIORITY SHOULD CONTINUE TO BE GIVEN TO PRACTICAL PROGRAMS AND PROJECTS. THESE PROGRAMS AND PROJECTS SHOULD BE DESIGNED TO YIELD DIRECT BENEFITS AND RESULTS WITHIN AN EARLY TIME PERIOD; THEY SHOULD ALSO ACT AS BUILDING BLOCKS WITHIN A LONGER TERM MORE OVERALL NETWORK APPROACH AND STRATEGY.

ORGANIZATIONAL, GOVERNANCE, FUNDING, AND LIAISON CONCERNS WILL INITIALLY BE DEALT WITH MOST EFFECTIVELY IN A MANNER LINKING VERY CLOSELY WITH PROGRAMS RATHER THAN AS SUBJECTS TO BE ADDRESSED AS TOPICS IN THEIR OWN RIGHT.

With respect to computerized library network development, these priorities are generally reflected in the sequence of the recommendations which follow: the on-line interconnection program, which is the subject of the next section and recommendation, is practical in nature and is assigned first priority.

2.4 An on-line interconnection program

This proposed program is directed towards making library and information resources more accessible to Canadians. A phased approach is proposed. Early phases include the following:

a) Further development of National Library data base policies and plans addressing, amongst others, the following issues:

- Reporting of records to the National Library data base and union catalogue
- Location service policy vis-à-vis other centres
- Terms and conditions for the sharing of records
- Tape exchanges
- Authority files
- Relevant standards

The purpose behind this work is to provide a basis for planning and inter-connection of the National Library's data base to other data bases. The policies and plans - or specific aspects of them, as appropriate - would be discussed with the library and information community. These discussions would include consideration of the plans and policies of other bibliographic centres in order to arrive at a consensus for interconnection and other cooperative activities.

b) The creation and mounting of an inventory of available data bases.

The purpose of this inventory is to assist the sharing of bibliographic data. The "CARL Conference on a National Bibliographic/Resource Sharing Network for Canadian Academic Libraries, October 1979" identified both the wish of CARL libraries to share bibliographic data and the need for an inventory to assist this sharing.

c) Pilot projects directed towards improved bibliographic data exchange.

This includes terminal-to-computer and computer-to-computer links. These links will be used to provide cataloguing data from the National Library data base, which is rich in bibliographic records. In the case of terminal-to-computer links for this purpose, some form of data transmission equipment will probably be used for the transfer of required records.

d) Improved facilities for document location and ordering of loans/copies.

When the National Library's machine readable data base is richer in locations, arrangements should be made to make this data base more directly accessible by users. Links to information retrieval facilities should also be developed. These links are desirable so that users who have searched for literature references can search for document locations and can order documents and copies through one compatible set of on-line procedures.

e) Expansion of the inventory of data bases to provide a network master index/directory and associated referral service.

This index/directory would provide the basis for a tele-referral service enabling users to find out where to go for information, for information services, and for documents/copies. This service could also be used to promote the use of Canadian services, helping to reduce the drain on the Canadian balance of payments (and employment levels) as Canadians tend to use foreign services while foreign users tend not to use Canadian services. (See pages 51 and 53 for a more complete description of the master index/directory.)

f) Improved interfacing and switching arrangements.

A combination of improved standards, additional software and additional hardware can be used to facilitate the accessing of existing centres by a higher proportion of existing terminals. Inter-centre communications can also be facilitated. The mounting of an on-line index/directory can be used as the first step towards a more fully developed service into which switching facilities are progressively built. These switching facilities could be employed by users to search one or more information retrieval facilities (e.g. for literature references) followed by access to one or more library data bases for the purposes of document location and the requesting of document loans and/or copies. There will be no legal or technical constraints on users to use the switching facilities: it will always be open to the user to employ other centres and to set up his own connections.

g) Increasing implementation of generalized computer-to-computer links.

As adequate protocols and supporting software become available, these links will increasingly take over from data transmission and less generalized computer-to-computer links. An example of a less generalized link is one which can only be operated between two centres with compatible releases of the same teleprocessing package, e.g. compatible releases of INTERCOMM software.

The above are summarized in the following recommendation:

RECOMMENDATION 3 : AN ON-LINE INTERCONNECTION PROGRAM

THE NATIONAL LIBRARY OF CANADA SHOULD IMPLEMENT AN ON-LINE INTERCONNECTION PROGRAM DIRECTED TOWARDS MAKING LIBRARY AND INFORMATION RESOURCES MORE ACCESSIBLE TO CANADIANS. EARLY PHASES IN THIS PROGRAM SHOULD INCLUDE:

A) FURTHER DEVELOPMENT OF NATIONAL LIBRARY DATA BASE POLICIES AND PLANS;

B) CREATION AND MOUNTING OF AN INVENTORY OF AVAILABLE DATA BASES;

C) PILOT PROJECTS DIRECTED TOWARDS IMPROVED DATA EXCHANGE;

D) IMPROVED FACILITIES FOR DOCUMENT LOCATION AND ORDERING OF LOANS/COPIES.

LATER PHASES SHOULD INCLUDE:

E) EXPANSION OF THE PROPOSED INVENTORY OF DATA BASES TO PROVIDE A NETWORK MASTER INDEX/DIRECTORY AND ASSOCIATED REFERRAL SERVICE;

F) IMPROVED INTERFACING AND SWITCHING BETWEEN INFORMATION RETRIEVAL AND LIBRARY PROCESSING FACILITIES;

G) PROGRESSIVE IMPLEMENTATION OF COMPUTER-TO-COMPUTER LINKS.

2.5 Network funding

The trend towards progressive decentralization and the involvement of many interests, both public and private, underscores the need for - as well as the difficulty of - promoting library and information networking in Canada. Strong material incentives are required to facilitate networking and to induce the diverse elements in the national information scene to work in a harmonious manner in the best interest of all concerned.

The principal present channel for development-oriented funding of the type required is the Supply and Services Canada (SSC) unsolicited proposals funding scheme. This program has not so far proved practical for the funding of substantial development-oriented network projects. The program suffers from important limitations. To begin with, the program is essentially concerned with short-term funding with no guarantee that sponsoring departments will obtain continuing funding for the sponsored program. Secondly, unsolicited proposals are, by their nature, ad hoc: it would be naive to expect such proposals to be any substitute for a continuing and comprehensive program directed towards implementing network development policies. Thirdly, the division of responsibility between SSC and the sponsoring departments adds to the inherent difficulties of dealing across jurisdictions and with often geographically remote organizations. What is needed in Canada is a funding source with a unified program, much greater continuity and better knowledge of the subject area, and commitments in the field of library and information services.

The need to provide incentives to facilitate cooperation in the library and information area is not unique to Canada. The need exists in other countries; the principal difference between Canada and other developed countries such as the US, Britain, France, West Germany and Sweden is that these other countries have rather well developed arrangements for promoting cooperation in the library and information area. These arrangements are outlined in Appendix B.

In Britain, the British Library R & D Department sponsors solicited and unsolicited research and development related to library and information operations in all fields. In Sweden, nearly half of the budget of the Delegation for Scientific and Technical Information Provision is available for support of R & D projects. The United States has numerous agencies which distribute multi-million dollar funding for nationwide library and information development.

With the progressive trend to more decentralized, more multi-jurisdictional arrangements, the need for material incentives similar to those provided in other countries is increasingly pressing. Indeed, in a library-poor[23] country like Canada, the need is even greater than in countries with richer library resources. It is, therefore, recommended that:

RECOMMENDATION 4 : NETWORK PROMOTIONAL FUNDS

THE FEDERAL GOVERNMENT OF CANADA SHOULD PROVIDE LIBRARY AND INFORMATION NETWORK PROMOTIONAL FUNDS THROUGH A UNIFIED PROGRAM TO ENCOURAGE AND FACILITATE NETWORK DEVELOPMENT THROUGH THE IMPLEMENTATION OF COOPERATIVE SCHEMES. TO ARRIVE AT THE FINAL IMPLEMENTATION OF THESE SCHEMES, FUNDS MAY BE REQUIRED TO SUPPORT A VARIETY OF ACTIVITIES INCLUDING PILOT PROJECTS, STUDIES, RESEARCH, LIAISON, EDUCATION, TRAINING, PUBLICITY AND TEMPORARY OPERATING SUBSIDIES.

THESE FUNDS SHOULD BE MADE AVAILABLE EITHER THROUGH THE NATIONAL LIBRARY OF CANADA ON THE ADVICE OF A COMMITTEE ON WHICH THE FEDERAL GRANTING AGENCIES WOULD BE REPRESENTED, OR THROUGH THE GRANTING COUNCILS ON THE ADVICE OF A JOINT COMMITTEE ON WHICH THE NATIONAL LIBRARY WOULD BE REPRESENTED.

2.6 Canadian library and information networking meetings

Library and information network development in Canada is of an increasingly decentralized and multi-jurisdictional nature. Multiple agencies are involved at all levels of government and in the private sector, and these agencies are located right across Canada. Six federal government of Canada agencies with legal mandates bearing on some aspects of library and information networking and 27 Canadian provincial/territorial agencies have been identified.[24] These figures do not include Canadian private sector agencies or the 12 Canadian library and information networking groups and facilities identified in the background paper Overview of computerized library networking in Canada.

Organizational arrangements are needed to promote cooperation between the various agencies concerned, although a number of organizational arrangements already exist.[25] Examples of existing mechanisms include the National Library Advisory Board and the Advisory Board for Scientific and Technological Information (ABSTI).

Arriving at appropriate and effective organizational or governance arrangements for library and information networking is no straightforward matter.[26] One problem is to avoid setting up a top-heavy cumbersome organizational superstructure which tends to become politicized and to substitute talk for action. At the other extreme, the problem is to avoid arrangements which are so weak as to be virtually non-existent, or so ad hoc and fragmentary that they are disorderly to the point of being chaotic.

The conclusion of the Study in this area is that organizational issues will be most easily dealt with on a pragmatic basis linked very closely to well-defined priority programs and problem areas. As these priority programs and problem areas are identified, groups can be formed on an ad hoc basis. The groups could be coordinated either by the National Library Advisory Board or by the National Library under the general policy direction of the National Library Advisory Board. Where there proves to be a continuing need for a group, it would meet on a continuing basis; where the need for a group proved temporary, the group would cease to meet as soon as its function had been fulfilled.

Examples of program/problem areas which might be the subject of the work of individual groups or committees are:

a) Data base policy/planning

Interchange of information on the data base policies and plans of participating network organizations is basic to the development of arrangements and links for increased sharing of data. Policy aspects include the free exchange of data versus charging for the data; the configuration of the network (e.g. what data is maintained where); and network standards.

b) Computer-to-computer protocols and links

National Library plans include the implementation of computer-to- computer links. One or more working groups will likely be required to arrive at the agreement of necessary protocols and to help coordinate the implementation of links.

c) Resource libraries schemes

The National Library plans include the implementation of a scheme of resource libraries across the country supported by collection development grants. Some form of working group will be required to develop this scheme.

d) Provincial/territorial library network plans

Any nationwide Canadian library network must accommodate the plans and developments within Canada's provinces and territories. As the provinces and territories develop plans, it will become necessary to find an effective means of interfacing these plans with each other and with relevant federal plans.

e) International library and information networking

Canada has its part to play within a wide international library and information network. The Unesco General

Information Program (PGI) is an important focus for international cooperation in this area, and countries like Britain and the United States have national committees for the Unesco PGI. A principal function of the national committees is to arrive at national positions and priorities which are then put forward at the international level. National Library plans project the formation of advisory committee and secretariat arrangements relating to the Unesco PGI and the Unesco program for information in the social sciences.

The approach proposed above is summarized in the following recommendation:

RECOMMENDATION 5 : CANADIAN LIBRARY AND INFORMATION NETWORKING MEETINGS

THE NATIONAL LIBRARY OF CANADA SHOULD CALL LIBRARY AND INFORMATION NETWORK MEETINGS AND/OR SET UP WORKING GROUPS AS APPROPRIATE WITH A VIEW TO:

A) AGREEING ON ACTION PROGRAMS TO ADDRESS PRIORITY NETWORKING CONCERNS AND ISSUES;

B) ESTABLISHING SATISFACTORY ORGANIZATIONAL, WORKING AND LIAISON ARRANGEMENTS CONCERNING THESE ACTION PROGRAMS;

C) ESTABLISHING SUITABLE ORGANIZATIONAL MECHANISMS TO ADDRESS NATIONWIDE LIBRARY AND INFORMATION NETWORKING CONCERNS AND ISSUES.

2.7 Network liaison and publicity

Library and information networking in Canada depends to a substantial extent upon voluntary agreements and arrangements. The voluntary nature of library cooperation in Canada has important advantages, but can only work effectively if there is a satisfactory level of dialogue, and a mutual appreciation of shared opportunities, problems and needs within the library and information community. This level of dialogue and mutual understanding can be achieved with more active promotion by the National Library in cooperation with other appropriate agencies including the Canada Institute for Scientific and Technical Information. To this end, it is recommended that:

RECOMMENDATION 6 : NETWORK LIAISON AND PUBLICITY

THE NATIONAL LIBRARY OF CANADA SHOULD EMBARK ON AN EXPANDED NETWORK LIAISON AND PUBLICITY PROGRAM DIRECTED TOWARDS INCREASED NATIONWIDE DIALOGUE AND COMMUNICATION CONCERNING NETWORK ISSUES, NEEDS, DEVELOPMENTS, PROGRAMS AND OPPORTUNITIES. THIS EXPANDED PROGRAM SHOULD INCLUDE:

A) IMPROVED NETWORK NEWSLETTER ARRANGEMENTS

AT PRESENT NATIONAL LIBRARY REPORTING IS ESSENTIALLY UNI-DIRECTIONAL: REPORTING ON NLC ACTIVITIES AND PLANS. THIS REPORTING SHOULD BE MADE MULTI-DIRECTIONAL: REPORTING ON ACTIVITIES AND DEVELOPMENTS NATIONWIDE AND (WHERE RELEVANT TO CANADA) ABROAD.

B) REGULAR REPORTING OF NATIONAL LIBRARY FORWARD PLANS

IN ORDER TO PROVIDE LEADERSHIP, THE NATIONAL LIBRARY MUST REGULARLY PUBLICIZE ITS FORWARD PLANS AND POLICIES. REPORTS OF FORWARD PLANS SHOULD BE PUBLICIZED AT LEAST ONCE A YEAR. CONVENIENT REPORTING TIMES CAN BE CHOSEN TO LINK WITH THE FEDERAL BUDGETARY CYCLE, E.G. THE ACCEPTANCE OF THE PROGRAM FORECAST FOR THE FORECAST PERIOD.

C) MEETINGS, CONFERENCES, WORKSHOPS

THE NATIONAL LIBRARY SHOULD BE MORE VISIBLE IN NATIONAL AND REGIONAL FUNCTIONS RELEVANT TO NETWORKING CONCERNS. WHERE APPROPRIATE, THE NATIONAL LIBRARY SHOULD SPONSOR OR CONTRIBUTE TO THE COSTS OF FUNCTIONS. IN MANY CASES IT IS NOT REALISTIC TO EXPECT INDIVIDUALS OR LOCAL, PROVINCIAL AND REGIONAL INSTITUTIONS TO BEAR THE COSTS OF NATIONWIDE NETWORKING DISCUSSIONS.

2.8 Network trends, developments and needs

Appendix A of this report notes a series of trends:

(a) The rapid rise in the demand and need for information.

(b) The growth in electronically stored information.

(c) The move towards mass remote access to on-line information services.

(d) Increasing decentralization.

Each of these trends has a significant potential impact on the future role of Canadian libraries. For instance:

(a) Will Canadian libraries be able to cope with the projected demands on their services? Will certain services become obsolete and little used?

(b) How will Canadian libraries adjust their services and programs to fulfill their missions in the coming world of mass remote access and other relevant technical, economic, and political developments?

(c) What will happen to deposit and archival functions in a world with an increasing proportion of electronic publishing[27], and with a variety of new techniques of data preservation and dissemination (e.g. videodisk)?

Canadian libraries need to consider that some of the means by which they currently fulfill their program objectives may become obsolete within a decade or so. At the same time, most of these questions are continuing ones and cannot be answered once and for all at a single point in time. A continuing planning program is required to assist Canadian libraries to take steps in time to adjust their programs and organizations in order to continue to fulfill their missions effectively in a changing world.

RECOMMENDATION 7: NETWORK TRENDS, DEVELOPMENTS AND NEEDS

THE NATIONAL LIBRARY OF CANADA SHOULD MAINTAIN A CONTINUING PROGRAM TO MONITOR AND EVALUATE TECHNICAL, ECONOMIC AND POLITICAL TRENDS AND DEVELOPMENTS RELEVANT TO THE NEEDS OF CANADIAN LIBRARIES AND THEIR USERS.

An early set of developments for evaluation by this program are those within the rapidly developing remote access/image transfer field of computer/communication technology. Examples of these developments include the spread of interactive television (videotex) systems; improvements in image transfer methods (tele-facsimile; Intrex-type systems using microfiche or videodisk); and new methods of storing, replicating and exchanging data bases (videodisk). These developments appear to offer potential for the National Library to fulfill its program objectives in new and more effective ways. A further set of developments for evaluation relate to the spread of electronic publishing. It will become necessary for the National Library to consider how it should fulfill its deposit, archival, bibliographic and lending/access functions

with respect to works in this form. A continuing program to monitor user needs is also required in order to meet changing needs and to assess the potential for new services.

2.9 National bibliographic data base

The use and usefulness of the nationwide computerized library network is dependent upon the scope, contents, quality and accessibility of the national machine readable bibliographic data base. Increasingly, this data base will not exist at a single location but will be made up of all the accessible bibliographic files at the nodes of the network.

The National Library has worked over a period of years to promote the development of the national bibliographic data base. The production and making accessible of CAN/MARC records has contributed high quality bilingual records to the base. The on-going automation of the Canadian Union Catalogues of Serials and Books represents an important cooperative approach to extending the scope and coverage of the data base, including location data for the holdings of Canadian libraries. Further programs with considerable positive impact on the data base include cooperation with the Université Laval to produce the Répertoire des vedettes-matière; participation in the International Serials Data System; the assignment and promotion of International Standard Book Numbers; and participation in the Shared Authority File (SHARAF) project. These programs all contribute to the development of a data base meeting the particular needs of Canadian libraries.

RECOMMENDATION 8 : CANADIAN NATIONAL BIBLIOGRAPHIC DATA BASE

THE NATIONAL LIBRARY OF CANADA SHOULD CONTINUE AND EXTEND ITS PRESENT PROGRAMS DIRECTED TOWARDS DEVELOPING A MACHINE READABLE CANADIAN NATIONAL BIBLIOGRAPHIC DATA BASE MEETING THE PARTICULAR NEEDS OF CANADIAN LIBRARIES. EXTENSION OF THE PROGRAMS WILL BE NEEDED TO PROMOTE THE ACCESSIBILITY OF MACHINE READABLE DATA EXISTING AT ALL THE NODES IN THE NATIONWIDE COMPUTERIZED LIBRARY NETWORK, AND TO FACILITATE THE FLOW AND USE OF THE DATA.

The need to facilitate the flow and use of machine readable bibliographic data is not limited to flow between, and use by, Canadian libraries. As various networks develop there will be

increasing need for inter-network data flow and use. Examples of other networks which will be increasingly interlinked with the Canadian computerized library network include international and foreign library networks; information retrieval networks; publisher and book trade networks; and networks specialized by form (e.g. archives, museums, audio-visual material) and by subject.

2.10 Network standards and guidelines

Standards and guidelines are important in facilitating the communication and interchange of information and information materials within international, national, and sub-national networks.

The National Library and CISTI are already quite heavily involved in standards/guideline programs. Substantial contributions have been made by these institutions in the areas of MARC format development, ISO Bibliographic Interchange Standards, development of character sets, ISBD, AACR2, and ISDS. At the national level, the National Library works closely with the Canadian Committee on Cataloguing and the Canadian Committee on MARC; internationally, the National Library participates in the Association of Bibliographic Agencies of Britain, Australia, Canada, and the United States (ABACUS) in order to coordinate its implementation of AACR2 with that of other national libraries. There is also full Canadian participation in the programs of the International Federation of Library Associations (IFLA), and relevant programs of ISO and Unesco.

Currently, development work is proceeding on a common communications format which would incorporate or integrate the requirements of the abstracting, indexing and library communities within one interchange standard. Work is also proceeding for the development of an International Standard Bibliographic Description (Component Parts), ie. ISBD(CP), which is expected to result in a standard for common bibliographic description for the abstracting, indexing, and library communities. With respect to bibliographic authority files, the National Library is contributing to the development of an interim authority file for Canadian libraries within the SHARAF project and is contributing to the development of standards for an international authority system.

The following recommendation generally supplements work already recommended in Recommendation 3 (An on-line interconnection program) above.

RECOMMENDATION 9 : NETWORK STANDARDS AND GUIDELINES

THE NATIONAL LIBRARY OF CANADA SHOULD CONTINUE ITS PRESENT PROGRAM FOR THE DEVELOPMENT OF STANDARDS AND GUIDELINES FACILITATING NATIONWIDE LIBRARY AND INFORMATION NETWORK DEVELOPMENT. IN VIEW OF THE RAPID RATE OF CHANGE IN THE LIBRARY AND INFORMATION NETWORK FIELD, THIS PROGRAM MUST BE OF AN ON-GOING NATURE AND MUST BE FLEXIBLE ENOUGH TO MEET CURRENT PRIORITIES AND NEEDS.

NOTES TO CHAPTER 2

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2. "DOBIS: the Canadian government version", by W. Newman, N. Brodie, E. Clyde, J. Dimsdale, M.J. Dunn and P. Mouland. Canadian Library Journal, Vol.36, no.4, August 1979. pp.181-194.

3. Memorandum for Associate Committee on Scientific Information on the cabinet decision for the dissemination for scientific and technical information, 19 December 1969.

4. One of the program objectives of the National Research Council is:

   "Implementation and maintenance of a Canadian network of scientific and technical information services and a referral service network including the establishment of links with other national and international networks and services". (Estimates for the fiscal year ending March 31, 1978, op. cit., p.23-32).

5. A policy for scientific and technical information dissemination, by the Science Council of Canada's Committee on Scientific and Technical Information chaired by Dr. Leon Katz. Ottawa, Science Council of Canada, 1969. (Science Council of Canada. Report no.6.)

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14. Scientific and technical information provision in Sweden: proposal for new organization.Report submitted by two Swedish government commissions, 1977 (Summary). Stockholm, Ministry of Industry and Ministry of Education and Cultural Affairs, 1978. 36p.

15. "Planning national information systems: Australia with some reference to New Zealand and Papua New Guinea" by G. Chandler. Unesco bulletin for libraries, Vol.XXXI, no.2, March-April 1977, pp. 98-106, 115.

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17. "National planning of information services" by Andrew A. Aines and Melvin S. Day. In: Annual review of information science and technology, Volume 10, edited by Carlos A. Cuadra, Ann W. Luke and Jessica Harris. Washington, American Society for Information Science, 1975, pp.23 and 26.

18. The future of the National Library of Canada. Ottawa, National Library of Canada, 1979, p.40.

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20. Reference 18, Appendix 1: "Toward a Canadian library network; the National Library's five year plan", p.58.

21. Matthews, William D. "The impact of technology on the governance of library neworks." In:The structure and governance of library networks; proceedings of the 1978 Conference in Pittsburg, Pennsylvania, by Allen Kent and Thomas J. Galvin. New York and Basel, Marcel Dekker, Inc., 1979, p.127.

22. Reference 18, p.43.

23. The future of the National Library of Canada report (Reference 18) provides an analysis of the situation in Canada with respect to library expenditures and recommends promotional funding to support library network development.

24. Library networking in Canada: the principal federal and provincial government agencies concerned. Ottawa, National Library of Canada, 1979.

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26. The management of the great Canadian library network, or it would be easier to find the Holy Grail, by Basil Stuart-Stubbs. Paper given to the Canadian Association of Research Libraries Conference on a National Bibliographic/Resource Sharing Network for Canadian Academic Libraries, Ste. Foy, Québec, October 23-25, 1979.

27. On October 2, 1979, Southam Inc. and Torstar Corporation announced that they had committed an additional $6 million to speed the development of an electronic publishing industry in Canada.

CHAPTER 3: IMPLEMENTATION

This chapter summarizes the principal early tasks associated with each of the recommendations in Chapter 2.

Table 3.1 below lists the tasks associated with each recommendation. The table also shows proposed start and finish years. In phasing the tasks, priority is given to the proposed on-line interconnection program (Program areas A-C). The other program areas (D-I) perform an essentially supportive role to the proposed on-line interconnection program.

Table 3.2 is an implementation chart showing the phasing of major tasks.

Table 3.1 : Principal early tasks associated with each recommendation

Major program areas/tasks	Recommendation numbers[1]	Start and finish years[2]
A. NLC data base policies and plans	3	1, continuing
A1 Preparation of internal data base policies and plans, including the DOBIS data base policies and plans; tape exchanges; REFCATTS; and the relationship of NLC/CISTI data bases.		1, continuing
A2 Discussions and exchange of information with bibliographic centres regarding data base policies and plans in Task A1.	(5)	1, continuing
A3 Prepare and maintain policy framework papers based on the above for purposes of Treasury Board.		2, continuing

1. All recommendations relate to Recommendations 1 and 2 which are not repeated in this column. Recommendation numbers in brackets show the interrelationships of other program areas to the program area indicated in the heading.

2. Year 1 commences on acceptance of this report by the National Librarian and on the availability of the required resources. Years 1, 2, etc. are not necessarily fiscal years.

Major program areas/tasks	Recommendation numbers[1]	Start and finish years[2]
B. Creation and mounting of an inventory of data bases	3	1, continuing
B1 In collaboration with CARL, decide on criteria for description of bibliographic data bases (including terms and conditions of availability of Canadian academic libraries, NLC, and CISTI.		1
B2 Develop and test questionnaire based on Task B1 and distribute it to academic libraries. (This task could be contracted-out).		1
B3 Compile inventory. (This activity could be contracted-out).		1,2
B4 Make inventory accessible for use, e.g. publication and/or mounting on appropriate computer services.		2
B5 Expand inventory to include further bibliographic data bases, e.g. federal government libraries, public libraries, community college libraries, and related consortia.		2,3
B6 Make inventory information compiled in B5 accessible for use, e.g. by publication and/or mounting on appropriate computer services.		3
B7 Decide on further types of inventory information to be compiled and mounted as a tele-referral service.		4, continuing

1. All recommendations relate to Recommendations 1 and 2 which are not repeated in this column. Recommendation numbers in brackets show the interrelationships of other program areas to the program area indicated in the heading.

2. Year 1 commences on acceptance of this report by the National Librarian and on the availability of the required resources. Years 1, 2, etc. re not necessarily fiscal years.

Major program areas/tasks	Recommendation numbers[1]	Start and finish years[2]
C. Pilot projects towards improved bibliographic data exchange	3	1, continuing
C1 Pilot project for computer-to-computer link between NLC DOBIS installations and another regional library systems.	(4)	1
C2 Terminal-to-computer pilot projects for transfer of cataloguing data to bibliographic centres, e.g. in Ontario, British Columbia, and the Atlantic Provinces.	(4)	2, continuing
C3 Terminal-to-computer pilot projects for transfer of location data. Examples of this include mounting of location data bases on CAN/OLE and remote terminal access to the DOBIS data base.	(4)	2, continuing
C4 Terminal-to-computer pilot projects to improve user access to a wider range of bibliographic centres, information retrieval centres, and document location and supply centres. This would include hardware and software to interface these systems, e.g. packet switching.	(4)	3, continuing
C5 Investigation of the need for and feasibility of using network front-ends to facilitate interfacing and switching among multiple centres.	(4)	5, continuing
C6 Establishment of operational programs based on pilot projects in Tasks C1-C5, e.g. further links between regional library system centres, further terminal-to- computer links for transfer of bibliographic and location data and for interfacing and switching among multiple centres.	(2)	2, continuing

1. All recommendations relate to Recommendations 1 and 2 which are not repeated in this column. Recommendation numbers in brackets show the interrelationships of other program areas to the program area indicated in the heading.

2. Year 1 commences on acceptance of this report by the National Librarian and on the availability of the required resources. Years 1, 2, etc. are not necessarily fiscal years.

Major program areas/tasks	Recommendation numbers[1]	Start and finish years[2]
D. Network promotional funding	(4)	1, continuing
D1 Provide direct support to studies relating to regional centre/DOBIS interconnection; pilot projects for interconnection; and library and information networking meetings.	(3, 5)	1, continuing
D2 Maintain and further develop NLC's working relationships with existing granting agencies, i.e. SSC, SSHRS, and NSERC, in order to make library and information needs known.		1, continuing
D3 Support appropriate networking projects submitted through the SSC unsolicited proposals procedure.		1, continuing
D4 Contract-out studies relating to areas of concern within the network area, e.g. inventories of data bases, user needs, protocol testing, etc.	(3, 7)	1, continuing
D5 In cooperation with TB/Inter-Council Coordinating Committee, study mechanism(s) whereby continued financial support can be made available to library and information network projects.		3
D6 Implement new/improved funding mechanisms following work under D5.		4, continuing

1. All recommendations relate to Recommendations 1 and 2 which are not repeated in this column. Recommendation numbers in brackets show the interrelationships of other program areas to the program area indicated in the heading.

2. Year 1 commences on acceptance of this report by the National Librarian and on the availability of the required resources. Years 1, 2, etc. are not necessarily fiscal years.

Major program areas/tasks	Recommendation numbers[1]	Start and finish years[2]
E. Canadian library and information networking meetings	5	1, continuing
E1 Meetings with bibliographic centres to discuss priority programs and issues, e.g. data base policies and plans.	(3)	1, continuing
E2 Meetings with other groups as appropriate, e.g. libraries in resource libraries scheme, CIP agencies in the CIP program, agencies concerned with the creation of a "UNESCO National Committee for the PGI".		1, continuing
E3 Creation of working groups/permanent committees, etc. as required after E1 and E2.		1, continuing
F. Network liaison and publicity	6	1, continuing
F1 Increased attendance at provincial, regional, and national meetings relevant to networking concerns.	(4)	1, continuing
F2 Publicizing of NLC plans and policies through publications and meetings.	(3)	1, continuing
F3 Publication of network newsletter on a quarterly basis.		2, continuing

1. All recommendations relate to Recommendations 1 and 2 which are not repeated in this column. Recommendation numbers in brackets show the interrelationships of other program areas to the program area indicated in the heading.

2. Year 1 commences on acceptance of this report by the National Librarian and on the availability of the required resources. Years 1, 2, etc. are not necessarily fiscal years.

Major program areas/tasks	Recommendation numbers[1]	Start and finish years[2]
G. Network trends, developments, and needs	7	1, continuing
G1 Continuing program to monitor and evaluate technical, economic, and political trends, developments and needs relevant to NLC program objectives.		1, continuing
G2 Conduct user needs studies to identify changes in needs and to identify potential for new services.		2, continuing
G3 Evaluate implications for NLC programs of the spread of interactive television (videotex) systems and of improvements in image storage and transfer methods (e.g. videodisk).		2,3
G4 Evaluate effect of electronic publishing on NLC programs.		4, continuing
H. Canadian national bibliographic data base	8	1, continuing
H1 Continue and extend current programs directed towards developing a machine-readable Canadian national bibliographic data base meeting the needs of Canadian libraries. This includes programs such as ISDS, ISBN, SHARAF, etc.		1, continuing

1. All recommendations relate to Recommendations 1 and 2 which are not repeated in this column. Recommendation numbers in brackets show the interrelationships of other program areas to the program area indicated in the heading.

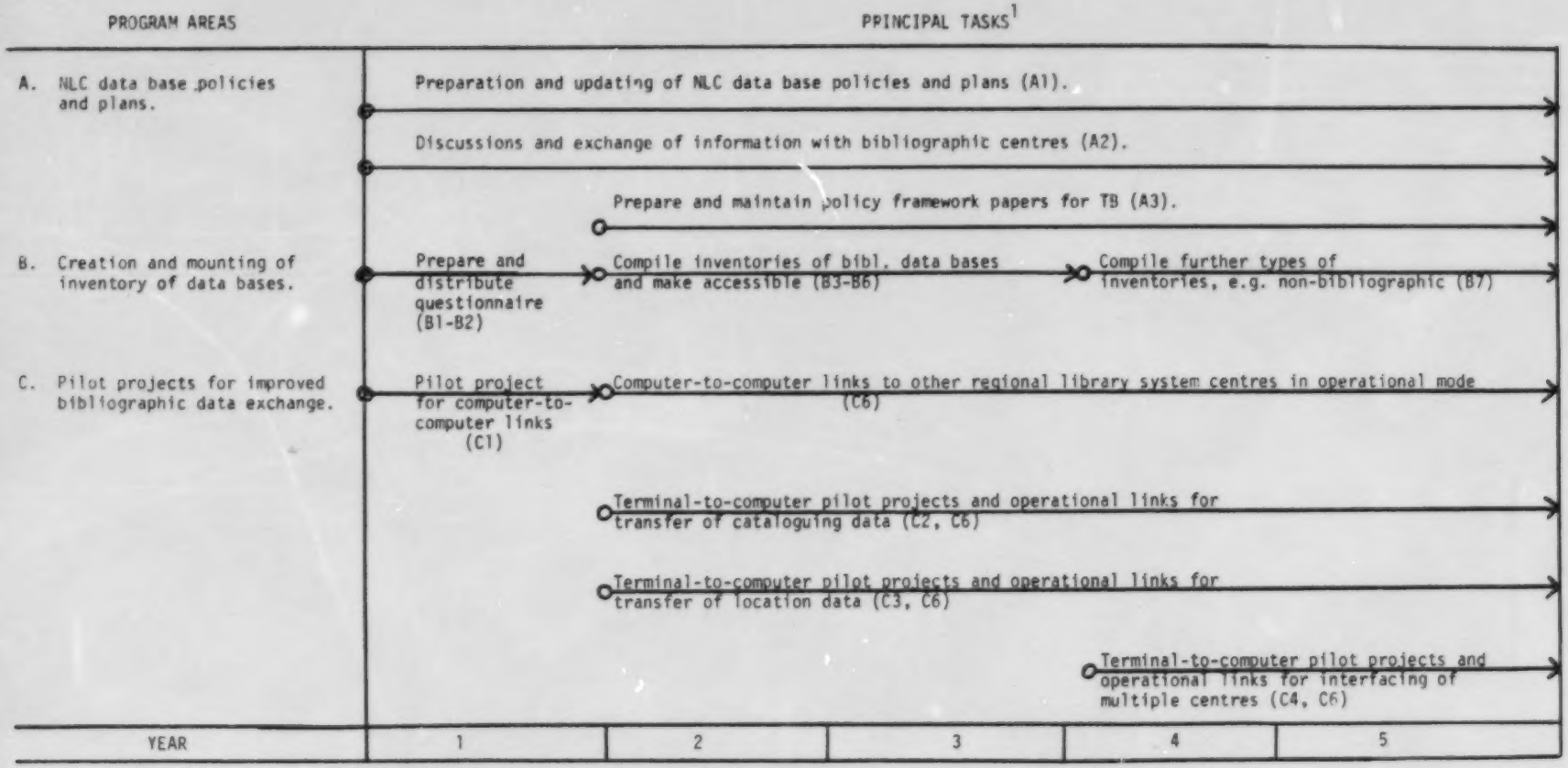
2. Year 1 commences on acceptance of this report by the National Librarian and on the availability of the required resources. Years 1, 2, etc. are not necessarily fiscal years.

Major program areas/tasks	Recommendation numbers[1]	Start and finish years[2]
I. Network standards and guidelines	9	1, continuing
I1 Continue participation in national and international committees developing standards and guidelines facilitating nationwide library and information network development. This includes monitoring of computer-to-computer protocol development, such as Task C1 (computer-to-computer links).		1, continuing

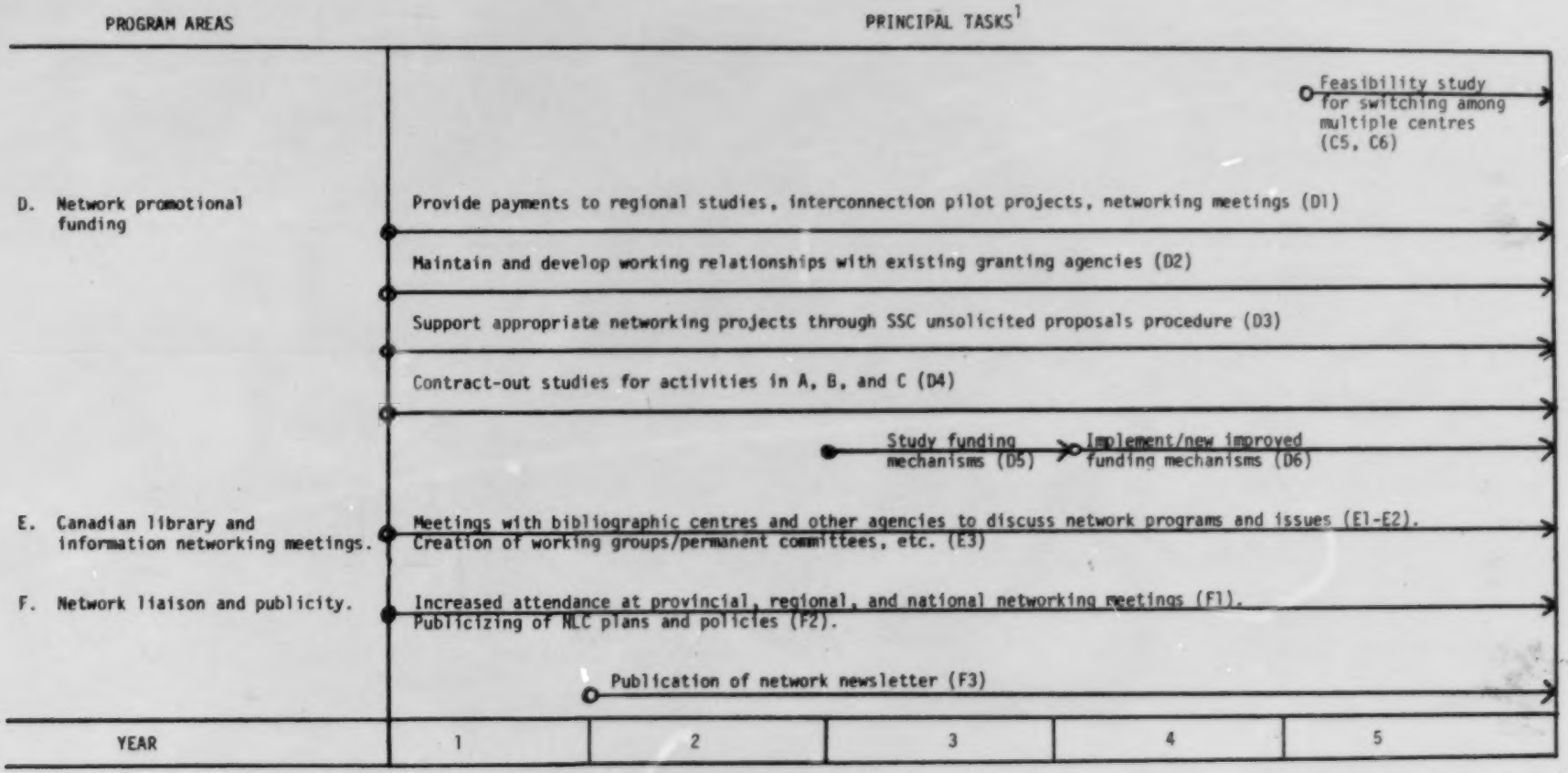
1. All recommendations relate to Recommendations 1 and 2 which are not repeated in this column. Recommendation numbers in brackets show the interrelationships of other program areas to the program area indicated in the heading.

2. Year 1 commences on acceptance of this report by the National Librarian and on the availability of the required resources. Years 1, 2, etc. are not necessarily fiscal years.

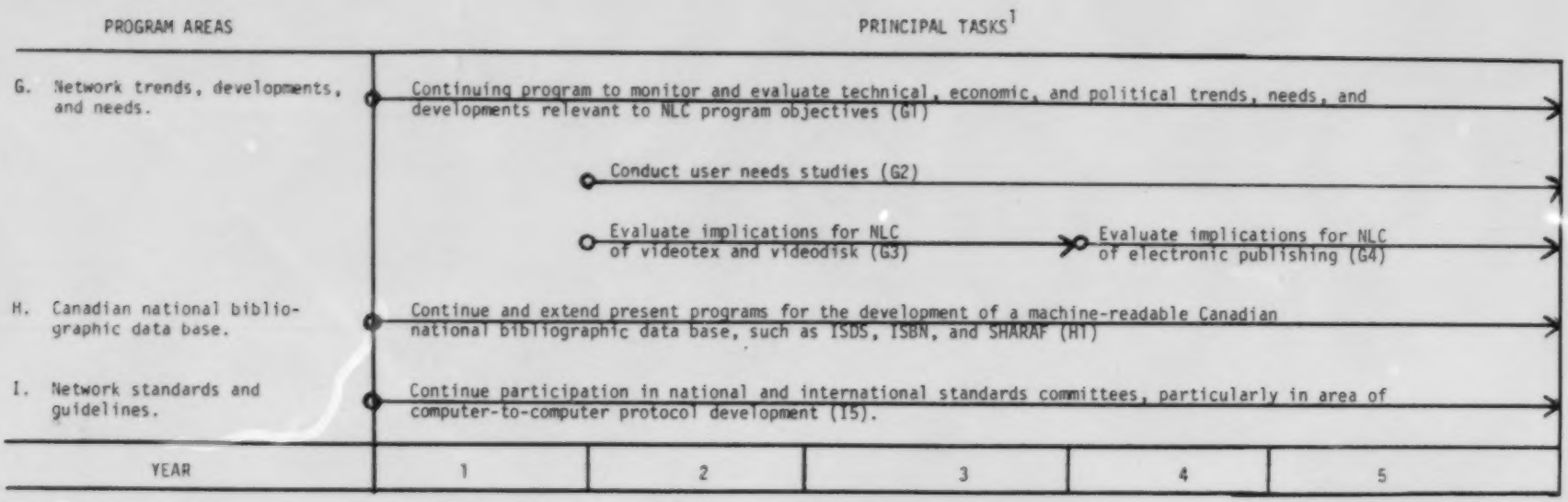
Table 3.2: Implementation Chart


PROGRAM AREAS
PRINCIPAL TASKS[1]
A. NLC data base policies and plans.
Preparation and updating of NLC data base policies and plans (A1).
Discussions and exchange of information with bibliographic centres (A2).
Prepare and maintain policy framework papers for TB (A3).
B. Creation and mounting of inventory of data bases.
Prepare and distribute questionnaire (B1-B2)
Compile inventories of bibl. data bases and make accessible (B3-B6)
Compile further types of inventories, e.g. non-bibliographic (B7)
C. Pilot projects for improved bibliographic data exchange.
Pilot project for computer-to-computer links (C1)
Computer-to-computer links to other regional library system centres in operational mode (C6)
Terminal-to-computer pilot projects and operational links for transfer of cataloguing data (C2, C6)
Terminal-to-computer pilot projects and operational links for transfer of location data (C3, C6)
Terminal-to-computer pilot projects and operational links for interfacing of multiple centres (C4, C6)
YEAR
1
2
3
4
5

Notes: 1. Task numbers (A1, etc.) refer to task numbers in Figure 1.
2. Years noted are those noted in Figure 1. See note 2 in Figure 1.


PROGRAM AREAS
PRINCIPAL TASKS[1]
Feasibility study for switching among multiple centres (C5, C6)
D. Network promotional funding
Provide payments to regional studies, interconnection pilot projects, networking meetings (D1)
Maintain and develop working relationships with existing granting agencies (D2)
Support appropriate networking projects through SSC unsolicited proposals procedure (D3)
Contract-out studies for activities in A, B, and C (D4)
Study funding mechanisms (D5)
Implement/new improved funding mechanisms (D6)
E. Canadian library and information networking meetings.
Meetings with bibliographic centres and other agencies to discuss network programs and issues (E1-E2).
Creation of working groups/permanent committees, etc. (E3)
F. Network liaison and publicity.
Increased attendance at provincial, regional, and national networking meetings (F1).
Publicizing of NLC plans and policies (F2).
Publication of network newsletter (F3)
YEAR
1
2
3
4
5

Notes: 1. Task numbers (A1, etc.) refer to task numbers in Figure 1.
2. Years noted are those noted in Figure 1. See note 2 in Figure 1.


PROGRAM AREAS
PRINCIPAL TASKS[1]
G. Network trends, developments, and needs.
Continuing program to monitor and evaluate technical, economic, and political trends, needs, and developments relevant to NLC program objectives (G1)
Conduct user needs studies (G2)
Evaluate implications for NLC of videotex and videodisk (G3)
Evaluate implications for NLC of electronic publishing (G4)
H. Canadian national bibliographic data base.
Continue and extend present programs for the development of a machine-readable Canadian national bibliographic data base, such as ISDS, ISBN, and SHARAF (H1)
I. Network standards and guidelines.
Continue participation in national and international standards committees, particularly in area of computer-to-computer protocol development (I5).
YEAR
1
2
3
4
5

Notes: 1. Task numbers (A1, etc.) refer to task numbers in Figure 1.
2. Years noted are those noted in Figure 1. See note 2 in Figure 1.

PART II:

NETWORK CONCEPTS

CHAPTER 4: CURRENT NETWORK CONCEPTS

4.1 Introduction

In framing the recommendations contained in Part I of the report, some assumptions were made concerning nationwide networking concepts. The purposes of Part II of the report are:

a) To outline those assumptions

- Chapter 4 and Chapter 5, Section 5.2.

b) To indicate that the proposals in Part I are an early concrete step towards a wider and more complete nationwide library and information network in the longer term.

- Chapter 5, Section 5.3

4.2 The Canadian library network

The proposals for action in Part I make the same assumptions concerning a Canadian Library Network as are made in the National Librarian's The future of the National Library of Canada report. The major relevant assumptions are summarized below, commencing with the network concepts of the Canadian Union Catalogue Task Group which were carried forward into The future of the National Library of Canada report.

4.2.1 Principal network concepts of the Canadian Union Catalogue Task Group

The Task Group included Chief Librarians from libraries across Canada. It submitted its report in 1976 following four years of work. The Group viewed the Canadian Library Network as having three major components: a "bibliographic network", a "resource network", and a "communications network". The Task Group described these subordinate networks as shown below.

a) The bibliographic network

The Canadian Union Catalogue Task Group described this network concept in the following terms:

"Fundamental to the existence of a Canadian Library Network is a bibliographic network, comprised of interrelated files of records describing not only the holdings of individual libraries in the library network but also records for works whether or not held by any Canadian library.

This bibliographic network has several functions to perform. First, it must be capable of identifying specific items accurately, millions of such items. Second, it must be able to locate those items within thousands of libraries. Third, it must provide comprehensive descriptive bibliographic information. Fourth, it must allow for the analysis of library contents, particularly by subject. In its fullest stage of development, such a bibliographic network will be a powerful tool for gaining access to the mass of material to be found in library collections...

To some degree, this bibliographic network already exists in a number of union catalogues, union lists, cataloguing support services, and information services, maintained and provided by libraries and groups of libraries throughout Canada. At present these operations are not always linked or unified. For example, existing union catalogues and union lists are separately created and maintained, although this involves a significant amount of duplication of effort. Although it need not always be the case, there is little connection among the various kinds of operations: union catalogues are usually restricted to books, union lists of serial publications, while cataloguing support services and information services are provided from yet other files. Reliance on conventional methods of file creation, maintenance, and access are largely responsible for this situation."[1]

The Task Group report went on to provide an approximately 20 page review of union catalogues, union lists and union bibliographic data bases in Canada.

b) The resource network

The Canadian Union Task Group described this as follows:

"... the purpose of the resource network is to provide ... (library) materials ... That is, ideally a fully developed resource network should provide access to all items in all libraries on behalf of individuals everywhere.

> To a degree such a resource network exists already, in a somewhat informal and unstructured way, because interlibrary lending is a well-established practice. However, the network as it exists is not capable of fully exploiting the resources of Canadian libraries, nor of exploiting them on behalf of all Canadians. The bibliographic network will make it possible to identify more items in more libraries. It remains for a resource network to make these items available more generally."[2]

The Task Group report provides a review of the Canadian resource network as at 1975/76.

c) The communications network

The Canadian Union Catalogue Task Group described this as follows:

> "To mobilize the bibliographic and resource networks on behalf of the individual library user, a communications network is necessary. It is the key to the functioning of the total network. As in the case of the other two networks, this communications network already exists in a complex of postal, telephone, telecommunication, delivery, and data transmission services; a combination of these is involved now in the supplying of an item in one library to a user in another. In effect, libraries use whatever means they can among those which are available to them. But no comprehensive, integrated plan or system of communications among libraries exists on a national basis."[3]

4.2.2 Principal network concepts in "The future of the National Library of Canada" report

The following quotation from Appendix 1 of The future of the National Library of Canada report summarizes the network concepts in that report:

"The objectives of the Canadian library network are:

- sharing of library collections, bibliographic records and specialist expertise to better meet users' needs;

- the best and most economical use of scarce human and financial resources by eliminating unnecessary duplication in library collections, storage and services, and by cost-sharing activities;

- the preservation of the national cultural heritage and the promotion of information on Canada at home and abroad;

- the conservation of valuable library materials for the future.

The network would be built using, when possible, components already in place and existing strengths (collections, systems, specialist expertise). It would be as decentralized as possible but based on a common, agreed on policy and plan. Services which can most effectively be provided centrally would be so provided. Compatibility at higher system levels should still permit individual variations at local levels. All resources in the network should be available to all who require them.

The overall functions of the network would be:

1. resource sharing

2. referral and advisory services;

3. information retrieval and bibliographic activities in specific subject fields;

4. shared cataloguing, including control of name and subject authorities and the production of bibliographic products as required;

5. the creation of a cooperative national bibliographic data base which would support all of the above functions as well as assist individual libraries in carrying out housekeeping operations;

6. a system of library network management information and statistics;

7. a national plan and program for the preservation/conservation of library materials.

To enable such a network to fulfill all of these functions, specific requirements must be met. Library and bibliographic standards must be developed including CAN/MARC (MAchine- Readable Cataloguing) formats for various types of materials and standards for computer protocol. Such a network, in Canada, must be accessible in both French and English. As the network will encompass many libraries, it must be able to receive input from and provide access to multiple libraries. It would have to provide an interface with Canadian library systems, as well as with international systems in which Canada is now participating or plans to participate.

The network, to be effective, should be capable of operating at three levels:

1. national/central services and international interface;
2. regional/provincial/type of library/consortia groups; and
3. individual institutions.

Levels 1 and 2 will be joined by computer to computer links. Levels 2 and 3 will, for the most part, be joined by terminal to computer links.

The functions of the national/central level would include:

1. overall network planning and liaison;
2. development and promotion of standards;
3. coordination of interface with international network nodes;
4. national data base authentication;
5. provision of bibliographic records for current and retrospective Canadian materials, and provision of records from foreign sources in the Canadian MARC format;
6. funding for research and development and network studies;
7. development of protocols for computer to computer links;
8. provision of nationwide lending and location services;
9. collection development funding for resource and back-up libraries;
10. conservation/preservation plan and services.

All of these functions are included in the scenario outlining the National Library's role in the Canadian library network. However, some functions or nationwide services may be carried out by contract or agreement with other network levels.

Functions at the regional/provincial/type of library/consortia level would include:

1. regional secretariat and liaison with other levels;
2. shared cataloguing and other shared housekeeping services and products;

3. union catalogues and location services;

4. resource sharing and document delivery;

5. information retrieval;

6. provision, by agreement or contract, of central services to the whole or part of the network;

7. research and development and other studies;

8. interface with other levels;

9. management information.

To these would be added more specific functions to meet the requirements of the particular network group.

At the individual institution level, functions have been identified as:

1. operation of in-house cataloguing, circulation, acquisition and serials control functions;

2. provision of direct services to users;

3. contribution of resources to be shared (e.g. records, collections, expertise) to the other levels as appropriate."[4]

4.3 The Canadian nationwide computerized library network

The existing Canadian computerized library network as it existed in 1977 was described in the Background Paper[5] of the Canadian Computerized Bibliographic Centre Study. This paper described various aspects of the network including its three Library Processing Facilities and seven Library Network User Groups. The University of Toronto Library Automation Systems is Canada's largest Library Processing Facility. Major Library Network User Groups noted in the paper included the Ontario Universities' Library Cooperative System, Centennial College Bibliocentre Division, and the British Columbia Union Catalogue Project.

The Background Paper defines the term "computerized library network" as follows:

> "Two or more libraries engaged in resource sharing through formal or contractual arrangements for some common objectives. Resource sharing is largely effected through the application of computer and communications technologies."[6]

The addition of the word "nationwide" to "computerized library network" implies that there are a considerable number of participating libraries located in all main regions of Canada and that their resource sharing extends beyond local and regional boundaries.

It is envisaged that the future nationwide computerized library network in Canada will be less a monolithic entity and more a "network of networks". This "network of networks" will interconnect existing and emerging networks which may be specialized (for instance, by subject and/or type of library); and/or limited in geographic extent; and/or limited by function - e.g. cataloguing, interlibrary loan, collections development, reference information.

The future nationwide computerized library network will support all the Canadian Library Network functions listed briefly in the previous section. A more detailed list of functions can be identified. These will parallel the functions identified by Williams and Flynn[7] based on a survey of 150 networks covering every kind of cooperative endeavour:

management; administration; acquisitions; cataloguing and catalogue production; processing/preparation; information retrieval; circulation; serials control; interlibrary loan; delivery; storage; referral; communications; education; standardization; marketing; systems development and support.

NOTES TO CHAPTER 4

1. Canadian Union Catalogue Task Group. Final report to the National Librarian of Canada, 1976. Ottawa, National Library of Canada, 1976, p.11.

2. Reference 1, p.38.

3. Reference 1, p.54.

4. The future of the National Library of Canada. Ottawa, National Library of Canada, 1979. (Towards a Canadian library network: the National Library's five-year plan. Appendix 1, pp.57-59.)

5. Overview of computerized library networking in Canada. Ottawa, National Library of Canada, 1979.

6. Reference 5, Appendix D, p.10.

7. "Network topology: functions of existing networks", by J.G. Williams and R. Flynn. In: The structure and governance of library networks; proceedings of the 1978 Conference in Pittsburg, Pennsylvania, by Allen Kent and Thomas J. Galvin. New York and Basel, Marcel Dekker Inc., 1979, pp.59-61.

CHAPTER 5: THE NATIONWIDE LIBRARY AND INFORMATION NETWORK IN THE LONGER TERM

5.1 Introduction

In the longer term, increasing interconnection will widen the scope of the nationwide computerized library network. There will be interconnections between the present largely separate library processing and information retrieval networks. Users will be able, for example, to perform searches on multiple information retrieval centres, store the relevant literature references obtained, then search location data bases and place electronic orders for document images (image transfer, e.g. from videodisk), for telecopies (electronically transmitted copies which are printed at the user's location), for photocopies, or loans of documents.

Section 5.2 below describes the network in conceptual terms. Section 5.3 shows the relevance of the proposals for action (Chapters 2 and 3 above) to network development in the longer term.

5.2 Network services and resources

As the network develops, the user will be able to access remotely a wider and wider range of network services and resources. This is illustrated in Figure 5.1 below.

The network services and resources illustrated in Figure 5.1 are reviewed briefly below.

5.2.1 Referral and reference facilities

These facilities are oriented primarily towards the support of remote access to referral and reference services. Referral services provide information concerning where to go in order to find what the users require. Reference services include the provision of reference information which may include literature references, facts, figures, and other reference data.

a) Computer-based referral services

These include directory-type data bases. A master index of available services and resources data bases would be the major example of this type of data base, but it does

not yet exist. Existing directory-type data bases are limited in number and have very few specific areas of coverage. A Canadian example is Environment Canada's Science and Technology (Environment) data base used to locate equipment and materials needed in the event of an environmental emergency such as an oil spill.

b) Non-computer-based referral/reference services

Examples include the Technical Information Service of the National Research Council, and the reference and information services of federal libraries and other units such as Agriculture Canada Information Services. A private sector example is the Financial Post's FIND/SVP information service.

c) Computer-based numeric and fact retrieval services

This is the largest and fastest growing group of data bases. Numeric and statistical data bases include Statistics Canada's CANSIM data base; chemical/physical property data bases include CHEMDEX; CHEMLINE; and CHEMNAME (they are all chemical dictionaries). Fact/answer-oriented (text and numeric/statistical) data bases include the Petroleum Data System (PDS) giving publicly available information on approximately 80,000 gas and oil fields in the U.S. and Canada and the federally owned Outer Continental Shelf.

d) Computer-based citation retrieval services

Citation retrieval data bases include, for example, the BIOSIS and Social Science Citation Index data bases made available through CISTI's CAN/SDI service. Other examples include the Alberta Oil Sands Index made available through the services of the University of Alberta and the Canadian Business Periodicals Index made available by QL Systems Ltd.

5.2.2 Document processing and supply facilities

These are facilities oriented primarily to support document description and bibliographic control, remote searching, location, and supply or display of recorded information. Recorded information includes many forms of material, including books, serials, maps, music, microforms, computer tapes and audio-visual materials.

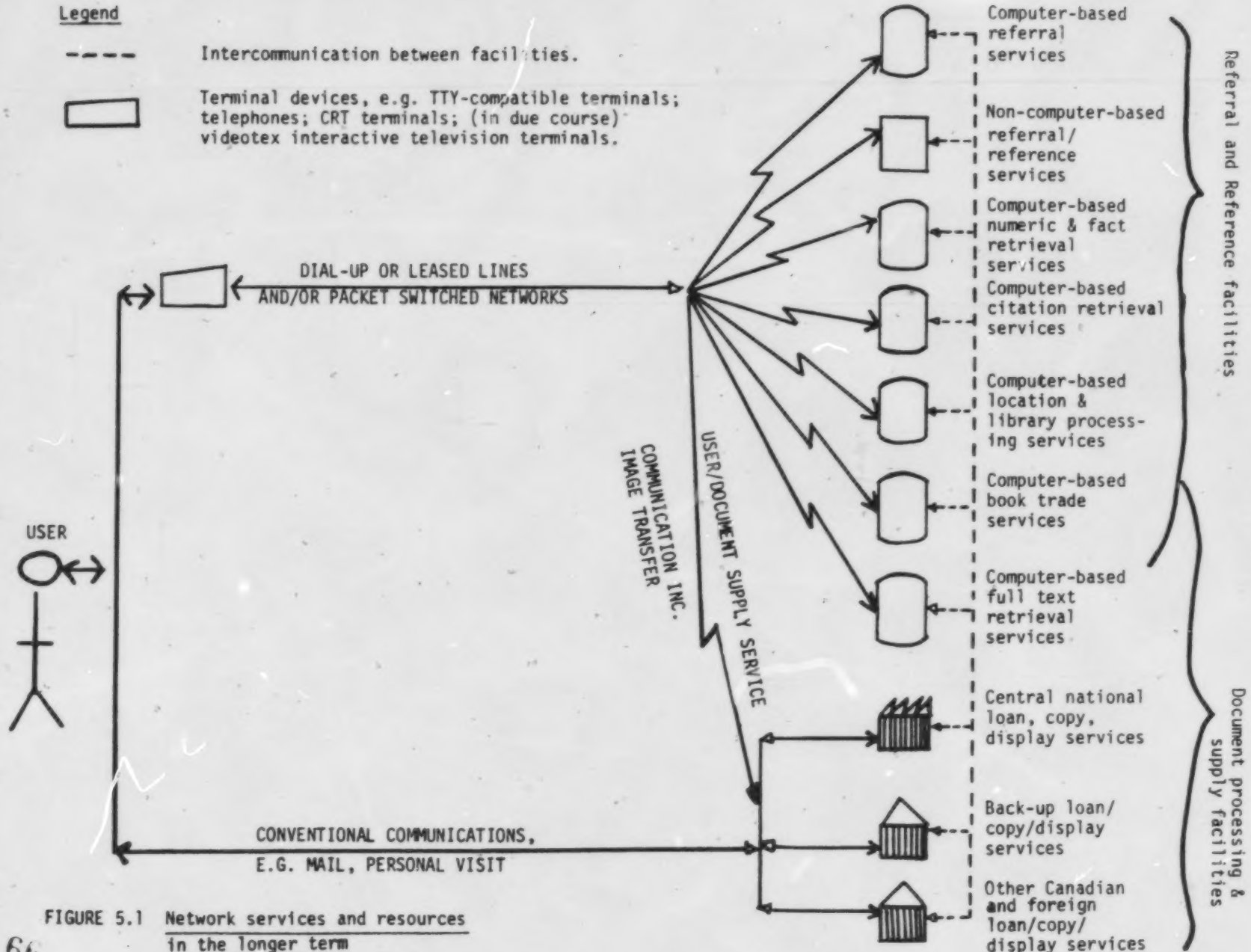

Legend
Intercommunication between facilities.
Terminal devices, e.g. TTY-compatible terminals; telephones; CRT terminals; (in due course) videotex interactive television terminals.
DIAL-UP OR LEASED LINES
AND/OR PACKET SWITCHED NETWORKS
USER
COMMUNICATION INC. IMAGE TRANSFER
USER/DOCUMENT SUPPLY SERVICE
CONVENTIONAL COMMUNICATIONS,
E.G. MAIL, PERSONAL VISIT
Computer-based referral services
Non-computer-based referral/ reference services
Computer-based numeric & fact retrieval services
Computer-based citation retrieval services
Computer-based location & library processing services
Computer-based book trade services
Computer-based full text retrieval services
Central national loan, copy, display services
Back-up loan/ copy/display services
Other Canadian and foreign loan/copy/ display services
Referral and Reference facilities
Document processing & supply facilities

FIGURE 5.1 Network services and resources in the longer term

As indicated in Figure 5.1, there is some overlap between reference and document processing and supply facilities in that literature references may be taken from citation retrieval and library processing data bases and may be supplied as reference information.

The major facilities noted in Figure 5.1 are briefly reviewed below. Data bases are listed first because they are more closely related to the referral and reference facilities reviewed in the last section. It should also be noted that the services listed below can perform many functions, eg. library processing services can also be used for information retrieval.

a) Computer-based location and library processing services

Location data bases include the "Union List of Scientific Serials in Canadian libraries" made available through CISTI's CAN/OLE service, and the REF/CATSS set of data bases made available through the University of Toronto Library Automation System (UTLAS).

Library processing data bases include the various MARC data bases (e.g. LC/MARC, CAN/MARC) made available through the National Library of Canada's MARC Records Distribution Service and through DOBIS.

A number of data bases fulfill more than one function. For example, the UNICAT/TELECAT data base is partly a cataloguing data base and partly a location data base.

b) Computer-based book trade services

These will include services for tele-ordering of publications, and services for the Canadian book trade, e.g. associated accounting, statistical and stock control service.

c) Computer-based full text retrieval services

These data bases include, for example, the Revised Statutes of Canada, available through QL Systems Ltd. Another example is the Toronto Globe & Mail's on-line INFOGLOBE data base containing the full text of the Globe & Mail since November 14, 1977. The INFOGLOBE data base is made available on-line via Datapac by Datacrown.

d) Central national loan/copy/display services

Presently, these are the collections of the Canada Institute for Scientific and Technical Information and of the National Library of Canada. At this point, there are no remote display collections although telefacsimile equipment already provides facilities capable of remote transfer of high priority items at acceptable costs (about $2/ page, Ottawa-Washington). Within 2-5 years, other image transfer systems will become economic; for instance, those based on remote video display of microfiche and on remote display of videodisk-stored images.

While central collections can be arranged for on-site use, they should be primarily organized for the provision of lending services. This implies some departures from usual library practices, eg. in physical arrangement. The British Library Lending Division in Boston Spa, England, provides an example of how central collections can be organized for efficient loan and copy services.

e) Back-up loan/copy/remote display services available under some form of formal agreement with the federal government

No formal back-up scheme presently exists: this is a projected element of the nationwide library and information network.

f) Other Canadian and foreign loan/copy/display services

Existing voluntary cooperative arrangements will, generally speaking, continue. The existing Canadian Union Catalogues and Lists maintained by the National Library of Canada and the Canada Institute for Scientific and Technical Information exemplify voluntary schemes in which libraries accept and process requests for interlibrary loans. Some libraries now charge for interlibrary loans; this does not alter the voluntary nature of existing interloan arrangements. These types of schemes will generally continue although changing circumstances will likely change the detailed working of the schemes.

5.2.3 Communications facilities

If they are not already, terminals will be the principal devices for access to network resources. Terminals are already the means of accessing the CAN/OLE countrywide services of the Canada Institute for Scientific and Technical Information, and the National Library of Canada receives, via Telex, the bulk of requests for Canadian Union Catalogue locations, as well as linking via terminals to such utilities as UTLAS for locations.

The use of terminals will increase as the number of terminals increases across the country. Dramatic increases in numbers of terminals are forecast as terminal costs drop and as a mass market develops for Videotex (interactive television) services with the majority of homes (and offices) having some form of terminal. Terminal access is gained through data networks (Datapac, Telenet, etc.), dial-up and leased telephone lines.

Other modes of access to network resources include telephone access, letter and visits. Telephone access and letter access will remain substantial for many years to come, particularly for accessing conventional reference services. Personal visits are a minority mode of access, at present, and are expected to decline as a proportion of total access.

Users seeking information, but not knowing where to go, would naturally start by accessing a master index or set of indexes to network resources and services. From this index or set of indexes, they would establish where to go to find what they required. No adequate on-line master index or set of indexes presently exists. The creation of adequate indexes would follow in the longer term from the implementation of Recommendation 3 in Chapter 2 above.

Having accessed the master index(es), the user seeking information rather than documents would likely access listed "conventional reference services" or search listed "numeric and fact data bases".

Users seeking documents would likely first consider citation retrieval services. Having searched one or more of these services and established what documents they want to consult, they would consult location data bases which would be flagged to show what material was available:

a) for remote display through a full text data base or via remote display facilities of central and back-up collections;

b) for loan, tele-copy or photocopy from central and back-up collections;

c) for loan or copy from other collections.

Having considered available options, users would electronically request the display, tele-copy, loan or photocopy and would provide information needed for billing of associated costs.

Libraries and other organizations requiring external processing services for cataloguing, indexing, etc., will access commercial or public sector centres providing this kind of service through computer/communication terminals. Some centres will provide a greater range of services than others. For example, the DOBIS system of NLC/CISTI may be eventually linked to full text data bases, document delivery services, publisher data bases, videotex systems like Telidon, etc. Access to various network services and resources will be increasingly facilitated by the progress towards interconnection and internetworking amongst individual systems, regional networks, consortia, etc.; by the growth of intelligent data networks; by the adoption of common standards and protocols, and by the growing scope and sophistication of the information industry.

These developments are likely to lead eventually to the emergence of "... a switched on-line network of decentralized data base resources, private and public, with relatively uniform access methods, standard computer communications protocols and search languages, and clear and consistent charging mechanisms and rules of operation. The Euronet development in Europe is a partial model of what is needed, linking various data bases by means of a packet-switching technology. Ideally, the end product would be comparable to the telephone network in providing fully switchable interconnections among user terminals and decentralized holdings of data bases, protecting both commercial and public agency interests, and removing network engineering considerations from the user's concerns."[1]

As the electronic revolution advances and computer terminals enter the mass market, library and information oriented networks will become increasingly integrated into the larger world of electronic communication.[2,3,4]

5.3 The relevance of the current proposals to network development in the longer term

The shorter term proposals for action presented in Chapter 2 are an early practical step towards a wider and more complete nationwide library and information network in the longer term.

The more general proposals concerning funding, liaison and standards are equally necessary in the development of a wider and more complete network in the longer term. Figure 5.2 below illustrates how the proposed on-line interconnection program might be developed in the longer term to provide improved indexing, interfacing and switching within the network. Several aspects may be noted:

a) Centralization/decentralization

Improved services would be implemented where most effective. For example, a master index/directory or set of indexes/directories to network resources would almost certainly be held centrally, but copies of these would likely be distributed to installations wishing to maintain a whole set or a subset of the indexes/directories.

b) Avoidance of monopoly situations

As illustrated in the figure, users would always be free to go directly to network resources and would not be forced to make use of given indexing, interface or switching services.

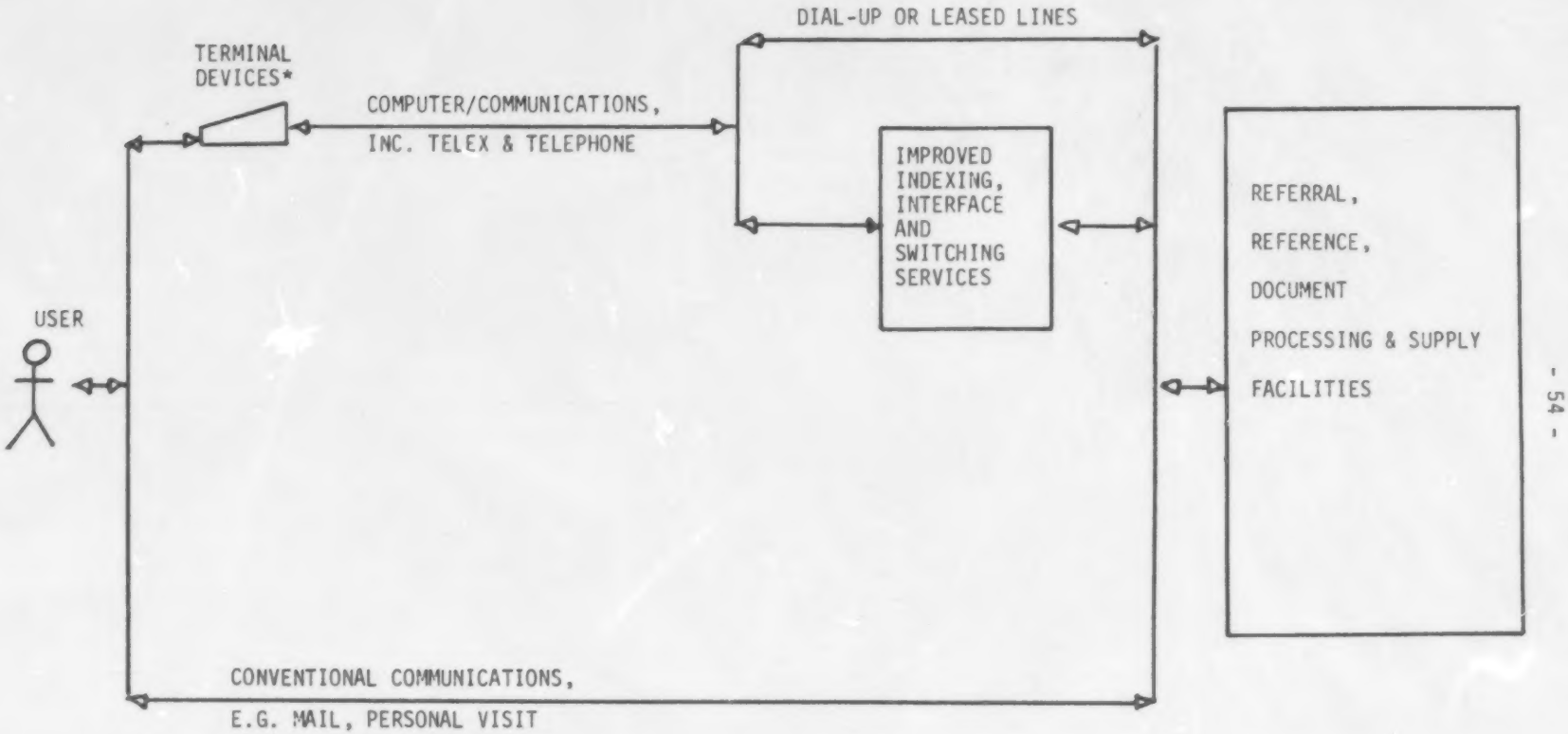
c) Indexes/directories/inventories of network resources and services

Improvements in this area would focus principally on providing access to a master index/directory (or set of these) to resources and services accessible through the network. These would likely include the following:

- Computerized bibliographic centres in Canada and foreign centres presently accessed by Canadians, including information retrieval facilities, library processing facilities, and library network user groups. The latter groups own many of the data bases to which library processing facilities offer access.

- The principal library and document supply facilities from which publications, copies, and document images may be obtained.

FIGURE 5.2: POTENTIAL LONGER TERM DEVELOPMENT OF THE PROPOSED ON-LINE INTERCONNECTION PROGRAM



*E.G. TTY-COMPATIBLE TERMINALS, TELEX/TWX, CRT, AND (IN DUE COURSE) VIDEOTEX INTERACTIVE TELEVISION TERMINALS

The primary purpose of this inventory is to enable users to obtain publications, copies and document images once precise requirements have been established through access to other services such as bibliographic search services.

- An inventory of major reference, referral and information services in Canada and abroad (i.e. those of high interest to Canadians).

- Information brokers and intermediary services in Canada and/or likely to be of use to Canadians.

  An inventory of these is especially valuable for users who prefer to have someone else perform searches of data bases on their behalf.

- An inventory of all publicly accessible on-line data bases in Canada and of publicly accessible foreign on-line bases of high interest to Canadians. The latter include US, European (e.g. EURONET) and international data bases which either presently receive a considerable level of Canadian use or which appear under-utilized by Canadians in view of the relevant nature of their content.

  The referral service master index/directory should desirably be made available on-line, although it - or portions of it - could also be distributed in microform and/or printed forms. The mounting of the on-line form of the index would be the first step towards a more fully developed service into which switching facilities are increasingly built. The fully developed service would offer the user the option of performing multiple searches on multiple centres without having to log off and log on each time a new centre is accessed.

d) Interface and switching services

Currently, the person wishing to access more than one centre on-line is left with numerous problems and inconveniences. Examples of these are:

- Some terminals cannot presently be used to access certain centres;

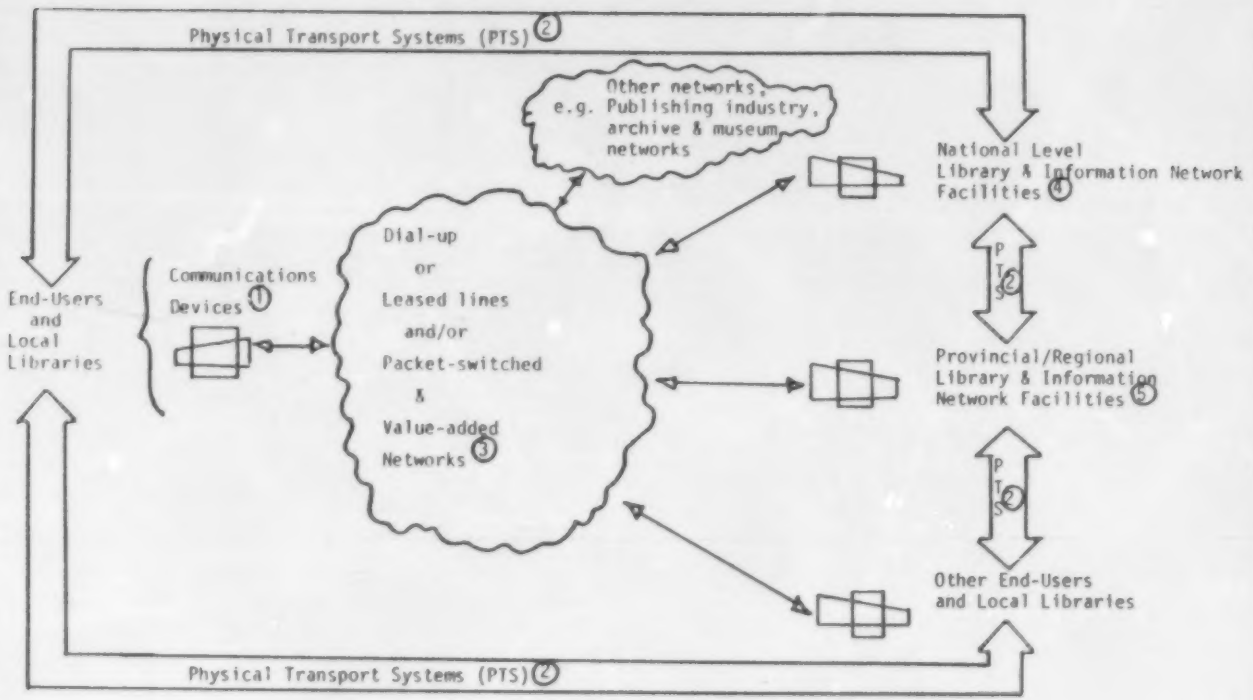
- The need to disconnect from centre 1 and arrange connection to centre 2, including dial-up and log-on procedures each time;

- Re-keying of original search data (usually) following reformulation of this data to accord with centre 2's (usually) different command language;

- On-line inter-action with centre 2 using (usually) different procedures from centre 1.

These problems and inconveniences would not be so important if they did not affect what is increasingly becoming a very common use pattern. This pattern is the search of one or more bibliographic or citation retrieval service data bases followed by access to other centres to order required documents. Great potential benefit lies in the implementation of hardware and software facilitating this type of access and minimizing user costs and inconvenience in making multi-centre searches followed by transactions to locate and/or order documents, copies and document images.

A promising means of facilitating multi-centre transactions of this type is the creation or adaptation of a software package for mini-computer hardware which users could install to facilitate internetworking. This hardware and software could provide a front-end interface for each of the Canadian computerized bibliographic centre computer installations. These interface machines could communicate via Datapac, Infoswitch, value-added networks based on these services, or via dial-up or leased lines. The interface machines could enable a wider variety of terminals to access each of the Canadian computerized bibliographic centre computer installations. At the same time document supply and delivery services could be improved through, for example, improved central lending/copying arrangements, library resource network schemes and improved document delivery arrangements (eg. use of air cargo). Figure 5.3 illustrates this approach. General purpose value-added data interchange networks are currently being tested in several industrial sectors. Present examples of these networks include the Canadian Trade Information Section, sponsored by the Federal Department of Industry, Trade and Commerce - and the Telidon/Vista network, the field trials of which are being actively assisted by the Federal Department of Communications. These general purpose value-added networks will grow in size, sophistication and number. It would be sensible for the Canadian library and information community to make use of these developments where they offer useful and cost-effective facilities, rather than to try to develop a self-contained special purpose library and information on-line data interchange network from scratch. The general approach should be to make use of existing developments where applicable; and to supplement these facilities with other needed interchange facilities (e.g. dictionary/directory, code/format) data/language


Physical Transport Systems (PTS) 2
Other networks, e.g. Publishing industry, archive & museum networks
National Level Library & Information Network Facilities 4
Communications Devices 1
End-Users and Local Libraries
Dial-up or Leased lines and/or Packet-switched & Value-added Networks 3
P T S 2
Provincial/Regional Library & Information Network Facilities 5
Other End-Users and Local Libraries
Physical Transport Systems (PTS) 2

Notes

1. (a) Terminal devices with or without interface hardware and software.
   (b) Host computers and interface hardware and software.
   (c) Image transfer devices, e.g. tele-facsmile, tele-copy.

2. Mail; van; courier; air cargo and personal visits.

3. (a) Telex/TWX networks.
   (b) Electronic mail facilities, e.g. DATAPAC.
   (c) General purpose networks, e.g. Canadian Trade Information System.
   (d) Videotex networks, e.g. TELIDON/Vista network.

4. Includes computerized library processing and IR services; conventional reference/referral services; central loan/copy/display services; interface/referral to foreign services.

5. Provincial/regional equivalents of note 3 items.

FIGURE 5.3: COMPUTERIZED NATIONWIDE LIBRARY AND INFORMATION NETWORK: SCHEMATIC DIAGRAM OF DATA AND MATERIAL FLOWS

translation, messaging, switching) as economic and practicable. Work towards improved document supply and delivery arrangements would go on in parallel with work on improved bibliographic access.

The above approach would go a long way towards meeting the essential need to promote, in an active and practical manner, an interconnected network of networks which can be used to transfer, rapidly and economically, electronically recorded information from where it is held to where it is needed, and to mesh with document supply facilities and needs. This approach implies work on appropriate standardization problems, including:

- Standards and guidelines for facilitating transactions between heterogeneous users, services and data bases, e.g. promoting compatibility and convertability;

- Computer-to-computer protocols and open systems interconnection.

NOTES TO CHAPTER 5

1. Guiliano, Vincent et al. Into the information age: a perspective for federal action on information. A report prepared by Arthur D. Little, Inc. for the National Science Foundation. Chicago, American Library Association, 1978, p. 53.

2. CATV and its implications for libraries, edited by Cora E. Thomasson. Urbana-Chempaign, Illinois, University of Illinois Graduate School of Library Science, 1974, pp. 64-65.

3. Hiltz, Starr Roxanne and Murray Turoff. The network nation: human communication via computer. Boston, Addison-Wesley, 1978, pp. 135-136.

4. Lancaster, F.W. Towards paperless information systems. New York, Academic Press, 1978, pp. 106-113.

Appendix A to the final report
of the Canadian Computerized
Bibliographic Centre Study

CANADIAN LIBRARY AND INFORMATION NETWORKING:

SOME RELEVANT LONGER TERM TRENDS AND NEEDS

Contents Page

1. General 1

2. Information needs grow and change 2

3. Growth of electronically stored information 3

4. Move towards mass remote access to on-line information services 5

5. The growing problems of traditional libraries 5

6. Canadian information service needs and capabilities 9

1. GENERAL

Developments in the computer/communications and library and information network fields are occurring at a rapid rate, and this rate of change shows no sign of diminishing. In this situation it is important to try to see the likely future impact of important trends. Otherwise shorter term planning may not fit well with longer term needs and developments. The purposes of this chapter are to identify some important relevant trends and needs.

The trends and needs identified below confirm and extend the findings with respect to computer/communications technology and applications presented in the Background paper.[1] These findings were essentially that technical and economic developments in the field of computer/communications are proceeding at an extremely rapid pace. This is extending the scope for improving benefit/cost in library and information applications at a correspondingly rapid rate. The strong trend favouring the replacement of traditional library and information systems and services with ones based on computer/communications technology is therefore a continuing and irreversible trend.

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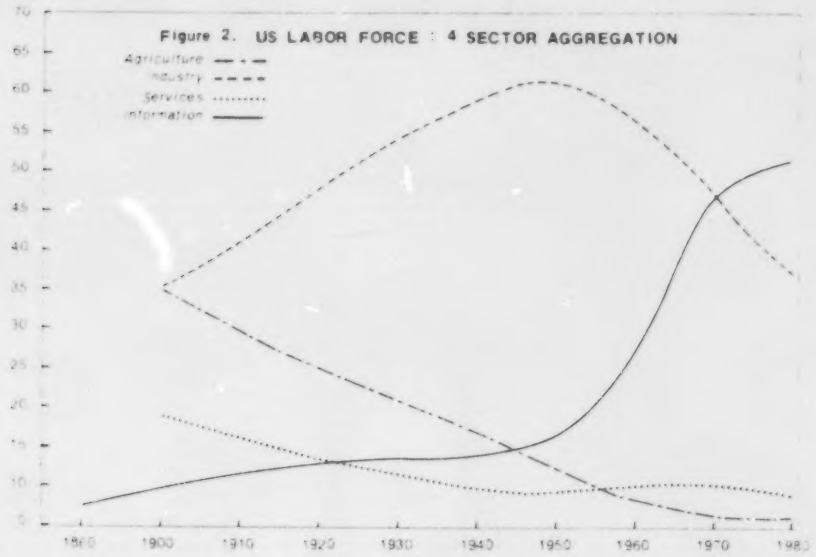
1. Overview of computerized library networking in Canada. Ottawa, National Library of Canada, 1979.

2. INFORMATION NEEDS GROW AND CHANGE

Within the last few decades the demand for information has increased enormously in all industrialized countries including Canada. An important indicator of this trend is the steady rise of information processing occupations in the labour force of these countries. Figure 1 relating to the U.S. labour force is a striking indicator of this trend. The figure is based on a classification scheme in which all occupations where the primary activity is processing information have been separately classified into a fourth or "information sector" of the economy.[1] The other three categories are net of information processing occupations.

Figure 1: GROWTH OF THE INFORMATION SECTOR IN THE U.S. ECONOMY



Source: Parker, Edwin B. "Background report." In: Conference on computer/telecommunication policy; proceedings of the OECD conference, February 4-6, 1975. Paris, OECD, 1976, p. 93. (OECD Informatics Studies, No. 11).

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1. Porat, Marc Uri. The information economy: Definition and measurement. Washington, D.C., U.S. Department of Commerce, Office of Telecommunications, May 1977. [Publication No. 77-13(1)].

There is a certain amount of arbitrariness in the classification of occupations into information processing versus other activities. By the more liberal definitions, information based occupations accounted for more than half the labour force in the U.S. in 1970. By the more conservative definitions, 50% will not be reached until 1980. Either way the general trend is quite clear at least in the U.S., namely, that the basic structural change that has taken place in the U.S. economy since 1950 is the growth of information occupations relative to industrial occupations. While no such figures are available for the Canadian economy, the general trend is unlikely to be different, except for a certain time lag.

This massive growth of the information sector in the economies of industrial societies is matched by the increasing complexity and variety of their information needs. Decision making of all kinds is becoming increasingly dependent on the prompt availability and assessment of appropriate information. As science, technology, commerce, and governments are all inextricably interconnected in these societies, a growing proportion of information requirements are multi-disciplinary in nature. And to all this must be added the immense appetite of a literate citizenry for all kinds of information for self-education, recreation, and for coping with the complexities of modern life. A nation's information system is thus becoming a vital instrument of economic and social progress, far more than at any other times in the past.

3. GROWTH OF ELECTRONICALLY STORED INFORMATION

The rapid growth in the quantity and use of electronically stored information in recent years is a development of great significance. Data bases or electronic information sources are beginning to provide a strong and highly versatile alternative to conventional print and paper based sources.

There are now no less than 250 publicly accessible data bases in the U.S. and Canada not counting the thousands which are not publicly accessible in the private sector and in governments. This multi-million dollar industry is growing at an estimated rate of 20-40% annually and is characterized by increasing competitiveness and technological change. Table 1 indicates the general content area of 242 on-line data bases now publicy available through various network and information retrieval facilities.

Data base technology has already progressed to the point where users are increasingly being offered the facility not only to retrieve on-line the desired information (in the form of data, fact, text, etc.) but also the facility to manipulate, analyse, or process this information at the user terminal in diverse and unforeseen ways and to define their outputs for their own special needs.

Table 1. GENERAL CONTENT AREA OF 242 ONLINE DATA BASES PUBLICLY ACCESSIBLE IN THE U.S. AND CANADA

Data base type	Source				Reference	
Data area	Numeric	Fact	Properties	Full text	Bibliographic	Referral
Science & Technology	1	2	16	-	43	3
Business/ Economics/ Legal	109	4	-	7	15	1
Social Sciences & Humanities	6	-	-	-	18	1
Multi-disclipinary	-	-	-	-	10	6
Totals	116	6	16	7	86	11
			145		97	

Source: Directory of non-bibliographic data base services. Santa Monica, California, Cuadra Associates, February 1979.

Figures available as to the growth rates of different types of data bases and their actual use are not always compatible. Nevertheless there are many indicators of the high rate of growth of reference data bases[1] and much higher rate of growth of source data bases.[2] Publicly accessible source data bases already outnumber reference data bases by a factor of 1.5 in the U.S. and Canada. This trend is bound to gain strength as economic, technological and other forces combine to bring interactive information retrieval services within the reach of every home and office.

1. Hall, J.L., On-line information retrieval sourcebook. London, Aslib, 1977.

2. Tomberg, A., "Data banks: a survey". In:On-line information; 1st international meeting, London, 13-15 December 1977. Oxford, Learned Information Ltd., 1978, pp. 159-168. (ISBN 0-904933105).

4. MOVE TOWARDS MASS REMOTE ACCESS TO ON-LINE INFORMATION SERVICES

As information needs become increasingly ubiquitous and complex, the trend for universal and remote access to information becomes ever more urgent. It is hardly surprising that a move towards mass remote access is already taking place in the accelerating development of videotex systems in many industrialized countries. There is now a genuine worldwide interest in the development of videotex services and their integration with other existing and proposed telecommunication services. In Europe nearly all the nation PTTs'[1] are investigating the possibilities of introducing this service in their respective countries.

Videotex is currently in different states of development, and market trials are in progress in the U.K., U.S., Canada and a number of other countries. Examples of videotex systems are: Prestel in Britain, Telidon and Vista in Canada, Antiope in France, Qube in the U.S., etc. All are based on existing technology and all aim at exploiting the extensive public telephone and television networks that exist in all these countries.

The most important aspect of these developments is that it is only a matter of time until mass remote access to on-line information introduces a totally new dimension to the concept of information services. Videotex type systems will doubtless transform the home TV receiver into a cheap home and office electronic mail system. Factors contributing notably to the rapid evolution of mass access systems are: parallel developments in computing and telecommunications, falling costs of data transmission and terminal equipment, and growing investment in the information technology.[2]

In this environment it is becoming increasingly irrelevant to maintain any rigid distinction between library services and information services. As the electronic revolution advances these concepts will continue to converge. Libraries will have to redefine their role and purpose if they are to survive and flourish as a viable institution of the information society.

5. THE GROWING PROBLEMS OF TRADITIONAL LIBRARIES

The future of the National Library of Canada report provides an analysis of the situation in Canada with respect to library

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1. Postal, telephone, and telegraph agencies.

2. Aspects of these developments are reviewed in the CCBCS background paper: (Overview of computerized library network in Canada. Ottawa, National Library of Canada, 1979).

agencies engaged in information management, information research and information training, were merged to form a private corporation. This corporation, the GID, has a staff of 230, and an annual budget of $8,500,000 which is provided by the federal and state governments.

Total expenditures for the Program, 1974-1977, were approximately $220 million DM ($91.66 million Canadian). Federal funding at a more moderate level is continuing until the remaining specialized information systems have been created

3. UNITED STATES

In the United States, several agencies play a key role in the funding of information and library research and development:

The National Commission for Library and Information Science (NCLIS) promotes research and development activities that will extend and improve the nation's library and information-handling capability. Although it had limited grant funds in 1976/77 ($73,000), it received $3,500,000 in May, 1977 from Congress for the conduct of the White House Conference on Library and Information Services to be held in September 1979:

> "It will bring together approximately 500 leading educators, librarians, library trustees, publishers, representatives from industry and labor, state and national officials. The goals of the national conference are to seek improvement of the nation's libraries and information centres with increased and more effective use of all types of libraries by the public through development of a balanced intergovernmental system of services and funding from local, state and federal sources".

The National Endowment for the Humanities (NEH) awards grants to libraries for the development of humanities research collections and also recently for the building of computer networks among these collections. The amounts awarded in 1976/77 could not be determined.

The National Library of Medicine (NLM) administers a program of grants to assist medical libraries in developing better health and information services, particularly services that relate to the development of biomedical information networks. The NLM research grants are for basic and applied research projects that support investigations into more effective methods for disseminating health knowledge. NLM appropriated $8,000,000 for its research grant program in 1976/77.

recognized and addressed, because we have either failed to recognize the concern or refused to involve ourselves in it."[1]

To this failure to capitalize on the growth of the modern information sector may be traced many of the current difficulties of traditional libraries. Table 2 summarizes the characteristics of information transfer in advanced industrial societies and shows how narrow and insecure the economic base of traditional libraries is. The traditional academic library, for instance, is essentially an institution of a discipline oriented information era. Its target user group extends scarcely beyond the academic and research world. This group constitutes only a very small fraction of the total user population in a country and as such counts rather little in political arithmetic, especially at a time of declining student enrolments. Commercial organizations are already in the process of taking over some traditional library services. It is projected that by 1985 in the U.S. alone there will be eight to ten major bibliographic utilities, several of which will undoubtedly be from the private sector:

> "OCLC probably will continue to be the biggest. Others probably will include RLG, WLN, and several that originate from the private sector including Gaylord, Bowker, Lockheed, SDC, BRS, and CL Systems. Although these utilities will have had their origins in more specialized areas such as circulation control (CL Systems and Gaylord), shared cataloging (OCLC) and publications ordering (Bowker), each will offer a full range of cataloging, bibliographic search, circulation control, publications ordering and interlibrary loan services, either through their own utility computers or through automatic switching to another utility that offers the service. By late 1980's switching between service suppliers will be so automatic as to pose no inconvenience and will, in fact, be invisible to users (except for those who wish to use alternative suppliers), just as is the case today for the telephone system and for the electrical supply system. ILL requests will be switched automatically from the network of origin to another network when necessary."[2]

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1. White, Herbert S., "Information dependence" In: Aslib proceedings, Vol. 31, no. 2, February 1979, p. 84.

2. A comparative evaluation of alternative systems for the provision of effective acess to periodical literature; a report to the National Commission on Libraries and Information Science, by Arthur D. Little, Inc. Washington, D.C., National Commission on Libraries and Information Science, October 1979, p. V-2.

Table 2

CHARACTERISTICS OF THREE INFORMATION ERAS

"Wave" of Information System	Content of System	Target User Group/its size	User Sophistication	Typical Info. Institution/its Sponsor	Typical Information Vehicles/response time
discipline-oriented	truth of science, mostly dealing with physical systems	members of the discipline involved; from dozens to a few thousands; users generally individuals and heavily committed to disciplines	very high technical sophistication/communicate to members of a particular technical elite	research or technical library; technical journal/sponsored by members of a profession or by a university	print; books, journals/ publication time of months to years
mission-oriented	all of above; also truth of science as it applies to technological objectives, ways in which physical systems can be manipulated and controlled for practical purposes	technologists, engineers, applications people; usually a few thousand specialists – in a few special cases up to tens of thousands; users are part of team and committed for multi-year periods.	moderate to high technical sophistication/need to communicate across disciplines	special technical information centers; integrated document analysis, retrieval, processing systems/sponsored by agencies with major missions; NASA, DOD, AEC, NLM, etc.	printed reports, limited information repackaging; secondary vehicles employing computers/ response time of weeks, hours or minutes
problem-oriented	all of above; also wisdom and pragmatics which work in contexts of uncontrollable open systems that involve human as well as physical dynamics. Included must be legal, sociological, economic and demographic information and important social value inputs	large segments of the public in state and local governments; and all types of industries, communities, planners, conservationists, bureaucrats, newspapers, policy makers on all levels; hundreds of thousands up to millions; many users part of transient, relatively short-term conditions	range from very low to high technical sophistication/need to communicate across major cultural groups/heavy involvement of nontechnical professionals and political groups	all of the above plus online information supermarkets, commercial purveyors of repackaged government-originated information, data base publisher/consultants information intermediaries of various kinds play important roles in providing access, interpretation, evaluation; market mechanisms of rising importance	(unsettled as yet) probably will make heavy use of telecommunications and interactive remote-terminal computer systems for part of needs, together with data base publications, newsletters and all traditional media. Will eventually be integrated with automated office systems.

Source: Into the information age: a perspective for federal action on information, by Vincent Guiliano et al. A report prepared by Arthur D. Little, Inc. for the National Science Foundation. Chicago, American Library Association, 1978, p. 21.

There can be little doubt that traditional libraries' problems will continue to grow until they can manage to enlarge their constituency and hence their economic base. Materials handling and custodianship or bibliographic services alone can no longer provide an adequate base for the library and the library profession. Libraries must begin to concern themselves with the wider and socially more urgent problem of information transfer and delivery for all citizens. Only then can libraries expect to receive greater attention and material support from taxpayers and their leaders. Edward Shaw, President of the Research Libraries Group Inc., has made this point in the following terms:

> "I read recently that the only thing wrong with the American railroad industry is that it believes it is in railroading rather than in transportation. The library may avoid following the railroad by recognizing that it is part of the information function..."[1]

6. CANADIAN INFORMATION SERVICE NEEDS AND CAPABILITIES

In the light of the above trends and developments, it is clear that the most important challenge facing the planners and providers of library and information services in Canada is how to meet and keep pace with the growing information needs of the Canadian society. Of critical importance for the economic well-being of the country is the provision of information for R & D and for independent Canadian industries. Canada is sadly lagging behind in both of these areas as many a study has pointed out.[2] Our R & D spending is the lowest amongst the industrialized counries; we currently spend less than 1 percent of our GNP on R & D, and we are the only nation to do so. Spending on the provision of information services constitutes only a small fraction of total R & D spending. The situation is unlikely to improve without federal action. Given the peculiar economic nature of information and the kinds of economic system we have, there is not enough incentive for private sector expenditure on research and development of information services. Federal initiative is of paramount importance if Canada is to develop an effective library and information system within the next 10 to 15 year period.

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1. Why a research libraries network? Remarks by Edward E. Shaw, President, The Research Libraries Group Inc., before the Canadian Association of Research Libraries, October 24, 1979, p. 4.

2. The weakest link: a technological perspective on Canadian industrial underdevelopment, by John N.H. Britton and James M. Gilmour. Ottawa, Science Council of Canada, 1978. (Science Council of Canada, BAckground study, no. 43, p. 143, p. 181.)

As the information sector gains prominence in the economies of advanced industrial countries, their information industries are rapidly becoming instruments of economic growth and social change. Crucial to the growth of the information sector are an indigenous data base industry and an indigeous capability in information technology. Both are in a state of under-development in Canada. It is a matter of serious concern that Canada is so heavily dependent on imported information services and the foreign information industry.

This concern has been expressed in a number of recent studies and reports. Recognizing the seriousness of the situation, a major recent study has now strongly recommended that

> "The federal government, in concert with the governments of the provinces and the private sector, should stimulate forthwith the development of plans for the creation of Canadian owned private data banks as well as others funded by governments".[1]

Regarding the promotion of an indigenous information technology, the same study recommended that

> "The federal government should vigorously promote the development of plans for the manufacture and marketing of the Telidon information system and anciallary equipment. This would probably take the form of a joint venture involving major participation by the private sector and investment from both federal and some provincial governments."[2]

The penalty for not promoting an indigenous Canadian data base industry and a Canadian capability in the new information technology will be severe:

> "It is not difficult to envisage a few American home information networks dominating the market in the same manner as American online systems hold a virtual monopoly over automated bibliographic literature searching on this continent. American interactive television systems aimed at the general public, business establishments and institutions may attempt to penetrate the Canadian market as well, since information has always moved relatively freely across the border. For example services directed towards

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1. Clyne, J.V., et al. Telecommunications and Canada: report of the Consultative Committee on the Implications of Telecommunications for Canadian Sovereignty. Ottawa, Supply and Services Canada, March 1979, p. 63.

2. Ibid., p. 62.

> American and Canadian libraries could include acquisition and processing assistance in addition to bibliographic literature searching as a large proportion of the information required and information sources purchased by Canadians originates in the United States. Such sources include books, documents, serials, television programs, audiovisual and other types of material.
>
> Foreign competition facing the Canadian information community has serious economic and social implications. The increased movement of information to Canada would lead to a growing balance of payments deficit and in the long run to further cultural dependency on the United States".[1]

Already transborder data flow, connected with the data processing activities from Canadian subsidiaries of U.S. companies to their headquarters in the U.S., is costing Canada hundreds of millions of dollars in cash outflow. It is estimated that by 1985 the value of imported computer services will have increased to about $1.5 billion a year. As a result an estimated 23,000 directly related jobs will have been lost to Canada by that time.[2] It can hardly be expected that the trend will be arrested except by government action. Given the nature of our economic system and the peculiar economic nature of information, there is insufficient incentive for the private sector to take any strong initiative in this area. It will probably take 10-15 years more for Canada to reach the point when significant private sector investment in the information industry becomes attractive.

A bridge mechanism is needed over a 10 to 15 year period during which government must take the initiative in promoting a national capability in information technology and in mobilizing and unifying national information resources. Federal government agencies like the National Library and CISTI having responsibilities for certain nationwide library and information services can play a very useful role in promoting the Canadian information industry and the use of Canadian information technology.

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1. Pal, Gabriel. "The approaching information revolution and its possible implications for resource sharing in Canada". In: Proceedings of the seventh annual Canadian Conference on Information Science, Banff, Alberta, May 12-15, 1979. Ottawa, 1979, p. 295.

2. Clyne, J.V. et al., op. cit., p. 63.

Appendix B to the final report
of the Canadian Computerized
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1979-12-04

NOTES ON EUROPEAN AND U.S. ARRANGEMENTS TO PROMOTE NATIONWIDE AND COMMUNITY-WIDE NETWORKING

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Doreen A. Guenter
National Library of Canada
December 1979

1. INTRODUCTION

This appendix provides notes on the networking arrangements in selected European countries and communities and in the United States. It should be noted that the expenditure figures presented are not comprehensive; for example, some are library-oriented (e.g. United States) and some are STI-oriented (e.g. Commission of the European Communities). Because of these kinds of variations in the compilation of the figures and because the value of the research dollar is greater in Europe than in North America, a comparison of the expenditures in these countries is not made. The emphasis in this appendix is, therefore, directed to the existence of a nationwide library network concept and the mechanisms used to develop and administer nation-wide network programs.

All expenditures quoted are in terms of Canadian dollars.

2. EUROPE

2.1 Britain

The British Library R & D Department was created in 1974 to promote and sponsor solicited and unsolicited research and development projects related to library and information operations in all fields. It has, for example, contributed to the establishment of library systems such as the South West Academic Libraries Cooperative Automation Project (SWALCAP). Funds have also been provided for the testing and use of information technology, e.g. interactive television, facsimile transmission, and remote-access projects relating to microforms.

During 1977/78, the R & D Department had the following resources:

Person-years	32
Financial	£1.1 million (Can$ 2.1 million)

The coordinated disbursement of R & D funds is assisted by multi-level consultation arrangements. At the highest level, the British Library Board is itself a representative body, so the principal interests concerned with library matters have a direct hand in BL policy formulation. The Board also disburses some funds for the improvement of access to collections of national significance. The Board in turn is advised by the BL Advisory Council. Because of its broad-based membership, the Council enables the Board to become more fully aware of the views of the British

Library users. Advisory committees relating to the five major divisions/departments of the British Library have also been established. They are composed of specialized library users, librarians from all types of libraries, and library and information academics. Within the British Library and within individual divisions, further consultation arrangements exist. For example, the R & D Department uses a peer review system for the evaluation of each unsolicited and solicited proposal. It also participates in the Library Automation Systems and Services Option Study (LASSOS) which is exploring the options for the development of library automation systems in the United Kingdom and the possible role for British Library services.

2.2 Commission of the European Communities

Two of the most important divisions of the European Economic Community (EEC) are the Commission and the Council of Ministers. The Commission puts forward action proposals to the Council of Ministers and also assists in the implementation and administration of programmes agreed to by the Council of Ministers.

In 1971, the Council of Ministers adopted a resolution for the coordination of the activities of the nine member states in the field of scientific and technical information and documentation and for the establishment of an information network to improve the accessibility of this information in the EEC. To assist in implementing the resolution, the Committee for Information and Documentation in Science and Technology (CIDST) was set up.

Through CIDST and the Commission's Directorate General for Scientific and Technical Information and Information Management, it was possible to implement the European online information network, EURONET. EURONET is a facility which enables data terminals in any EEC country to gain fast access to scientific, technical, economic, and social information held on computer files (data bases and data banks) at distant service centres. The network is composed of four nodes or Packet Switching Exchanges (PSEs) in Frankfurt, London, Paris, and Rome and five multiplexer access facilities or Remote Access Facilities located in Amsterdam, Brussels, Copenhagen, Dublin, and Luxemburg. The Postal Administrations (PTTs) of the nine member states are responsible for the implementation and operation of the telecommunications network for EURONET.

By September 1978, approximately 115 (90 bibliographic, 25 factual) data bases and data banks could be accessed through EURONET. Users who are not familiar with the

services available can dial up a central facility containing user referral services. These services include a subject index to the information services available, details relating to the service suppliers, and up-to-date news on network problems or host problems.

The costs of implementing EURONET are:

1975-1977:

Telecommunications network costs	
EEC Commission share	$3,500,000
PTTs' share	1,500,000
Other costs	3,750,000
Total budget	$8,750,000

1978-1980:

Total proposed budget	$10,000,000
Total EURONET budget (1975-1980)	$18,750,000

The number of person-years involved is unavailable.

2.3 France

In France, the Service des Bibliothèques[1] of the Secrétariat d'État aux Universités is the principal library network planning agency. The Service has responsibility for budgets, plans, surveys, studies, and personnel matters relating to French university libraries, and local lending libraries, but not scientific libraries.

One of its divisions, the Division de la coopération et de l'automatisation (DICA), is responsible for development of a policy for cooperation between all state libraries. This involves the establishment of three cooperative centres (Centre bibliographique national (CBN), Centre des échanges internationaux (CEI), and Centre de coopération technique (CCT)), the development of a national library policy, and the organization of a computerized library network (Réseau informatique des bibliothèques (RIB)). As the figures below illustrate, DICA is one of the world's largest central national agencies specifically concerned with library cooperation and automation.

1. As of October 1978, the Service des Bibliothèques is a member of the Agence universitaire de documentation et d'information scientifiques et techniques. This agency is responsible for the development of a national cooperative interdisciplinary library centre and for the development of national library and STI policies.

It should also be pointed out that R & D funds are supplied to DICA programs (i.e. RIB) and other library/information services by the Bureau national de l'information scientifique et technique (BNIST). BNIST is responsible for studying and making proposals on the directions of a national policy for scientific and technical information; for preparing means of implementing the policy; and for monitoring its implementation.

Another agency, the Mission interministérielle pour la promotion de l'informatique (MIPI) is responsible for general government policy concerning the promotion of the use of systems analysis and data processing in France. It has also provided financial support to DICA programs (i.e. RIB).

The resources allocations to DICA for the promotion of computerized library networking in 1975/76 were:

Person-years	54
Financial	
DICA budget	3.9 million F
MIPI contributions to DICA programs	0.25 million F
BNIST contributions to DICA programs	0.40 million F
Total DICA program expeditures	4.55 million F

($1 million Canadian)

2.4 Sweden

In 1977, the Ministry of Industry and the Ministry of Education (Government Commission on the Coordination of Libraries and Documentation Services) issued a report entitled "Scientific and Technical Information Provision in Sweden". It recommended that a special delegation (outside the Swedish Royal Library) should assume the responsibility for overall planning and coordination and R & D (including education and training).

As a result, the Delegation for Scientific and Technical Information Provision was established on July 1, 1979. It is advised by a Board drawn from user representatives, e.g. higher education, academic research, and industry; representatives of public interest, e.g. labour organizations; and libraries, e.g. Royal Library. To further broaden its influence, the Delegation will be assisted by a number of permanent advisory councils and temporary working groups.

The three main thrusts of the Delegation's work are planning and coordination, R & D, and national services.

During 1979-80, the Delegation had the following resources:

Person-years	15	
Financial	Million Crowns	Million $ Canadian
R & D	7.0	1.75
Planning and coordination; national services functions	8.54	2.13
Total	15.54	3.88

2.5 West Germany

In late 1974, the Bundesförderungsprogram für Information und Dokumentation (IUD) or the "Program of the Federal Government for the Promotion of Information and Documentation" was approved for a period ending in late 1977. This program had two major elements:

a) Structural Form - it expressed the federal government's concept of a national framework for scientific and technical information.

b) Action Program - existing information resources were given additional funding to facilitate their coordination as described in the Structural Form.

One major goal was the coordination of several hundred independently working information services to form twenty large supra-regional information systems or "specialized information systems". About 50% of these subject specialized systems were established by the end of 1978; development of the remaining systems is proceeding on a slower step-by-step basis.

Another major goal was the establishment of an agency called the Gesellschaft für Information und Dokumentation MBH (GID) or the "Society for Information and Documentation". Its role would be to facilitate the coordination of large scale federal government information projects and to avoid duplication of government expenditures. This was achieved in January 1978 when six federal government

agencies engaged in information management, information research and information training, were merged to form a private corporation. This corporation, the GID, has a staff of 230, and an annual budget of $8,500,000 which is provided by the federal and state governments.

Total expenditures for the Program, 1974-1977, were approximately $220 million DM ($91.66 million Canadian). Federal funding at a more moderate level is continuing until the remaining specialized information systems have been created

3. UNITED STATES

In the United States, several agencies play a key role in the funding of information and library research and development:

The National Commission for Library and Information Science (NCLIS) promotes research and development activities that will extend and improve the nation's library and information-handling capability. Although it had limited grant funds in 1976/77 ($73,000), it received $3,500,000 in May, 1977 from Congress for the conduct of the White House Conference on Library and Information Services to be held in September 1979:

> "It will bring together approximately 500 leading educators, librarians, library trustees, publishers, representatives from industry and labor, state and national officials. The goals of the national conference are to seek improvement of the nation's libraries and information centres with increased and more effective use of all types of libraries by the public through development of a balanced intergovernmental system of services and funding from local, state and federal sources".

The National Endowment for the Humanities (NEH) awards grants to libraries for the development of humanities research collections and also recently for the building of computer networks among these collections. The amounts awarded in 1976/77 could not be determined.

The National Library of Medicine (NLM) administers a program of grants to assist medical libraries in developing better health and information services, particularly services that relate to the development of biomedical information networks. The NLM research grants are for basic and applied research projects that support investigations into more effective methods for disseminating health knowledge. NLM appropriated $8,000,000 for its research grant program in 1976/77.

The Division of Science Information (DSI) of the National Science Foundation provided $4,700,000 in 1976/77 to the support of research and development to improve access to scientific and technical information and to increase its effective use. Projects included investigations of the economics of information transfer for large components of the entire U.S. information transfer system, the problems of using on-line information services in a networking environment, tests of the value of computer conferencing and other forms of electronic information exchange, user-oriented research projects focusing on relationships between the use of STI and the effectiveness of scientists and engineers, and standards setting activities.

The United States Office of Education has two granting programs which make grants available on a project to project basis:

a) Higher Education Act, Title II-A, College Library Resources

Grants under this title are made for the improvement of library resources in academic institutions. Three types of grants are authorized:

i) basic grants, equal to the amount expended by the applicant for library material during the fiscal year;

ii) supplemental grants, related to enrollment, programs and demonstrated needs, up to $20 per full-time student;

iii) special purposes grants that must be matched on the basis of $1 for every $3 federal funds.

The later grant type is used for the encouragement of inter-library cooperation through the support of shared resources. In fiscal year 1977, $9,975,000 was appropriated for this program; this funding was reduced to $4,988,000 for fiscal year 1979 because supplemental and special purposes grants are being curtailed.

b) Higher Education Act, Title II-B, Library Research and Demonstration Program

This section of "Title II-B" authorizes grants and contracts to institutions of higher education and other public agencies to support research and/or demonstrations for the improvement of library and information services or for the improvement of education in information science and librarianship and for the dissemination of information derived from such programs."

Awards totalling $995,193 were made in 1976/77; the "application of data processing to libraries" category received the most awards. The appropriations level for 1979/80 has remained at $1,000,000.

The United States also has several federal programs which are specifically designed to aid public and school libraries. The Library Services and Construction Act (LSCA) is a state formula grant program with matching fund requirements for public libraries. Two parts of LSCA are of particular interest: Title I - Library Services and Title III - Interlibrary Cooperation.

Title I provides funds for the development and delivery of innovative library programs to disadvantaged persons, the institutionalized, the handicapped, and the aging, and for the strengthening of state library administrative agencies and metropolitan libraries. In 1976/77, $56,900,000 was appropriated by Title I. In the latest five year extension to 1981/82, $150,000,000 will be available for each fiscal year from 1980- 1982.

Title III program activities include:

(1) identification and location of library resources available in a state or region;

(2) establishment or expansion of interlibrary loan and reference networks to include all types of libraries and information centers and, in some states, regional medical libraries and technical information centers;

(3) expansion or establishment of processing centers using modern technology and equipment;

(4) coordination of the acquisition of materials among types of libraries; and

(5) in some states the establishment of regional area library councils.

In 1976/77, $3,337,000 was distributed to the states and territories. No matching of federal funds is required under this title. The latest extension of Title III to 1981/82 allocates $15,000,000 for 1977/78 and $20,000,000 for each of the four succeeding fiscal years.

The Elementary and Secondary Education Act; Title IV, Part B - Libraries and Training Resources "provides funds to states, outlying areas, and the Bureau of Indian Affairs, Department of the Interior, for the acquisition of printed and audiovisual

instructional materials, instructional equipment and minor remodelling, and testing, counselling, and guidance services for the use of children and teachers in public and private non-profit elementary and secondary schools." In fiscal year 1976/77, $154,330,000 was appropriated; this was increased to $171,000,000 for 1979/80.

The Council on Library Resources (CLR) was established in 1956 by the Ford Foundation which provided $29 million in support through 1977. In 1978, shared support of CLR began with multi-year grants totalling $1.5 million received from Andrew W. Mellon Foundation and the Carnegie Foundation.

CLR awards grants to individuals and organizations for projects supporting the development of a national library system (automation, networks, standardization), libraries and their users, library management, microforms and preservation, professional development, and international library cooperation.

National networking activities have been the primary beneficiaries of Council funds. From 1975-77, 40% ($2.5 million) of CLR expenditures were in this category. In 1976-77 alone, 30% ($1 million) of its budget was channelled to network development, library applications of computers, and the formulation of standards.

In February 1979, CLR announced a new Bibliographic Service Development Program (BSDP) to promote improvements in bibliographic procedures and products. Using $5 million provided over 4-5 years by seven private foundations and the National Endowment for the Humanities, BSDP will focus on three primary goals:

1. The provision of effective bibliographic services for all who need them;

2. The improvement of bibliographic products; and

3. Stabilization of costs of many bibliographic processes in individual libraries.

The total expenditures (Canadian dollars) in 1976/77 of the above programs were:

NCLIS	$3,573,000
NLM	8,000,000
NSF-DSI	4,700,000
HEA, Title II-A	9,975,000
HEA, Title II-B	995,000
LSCA, Title I	56,900,000
LSCA, Title III	3,337,000
ESEA, Title V-B	154,330,000
CLR	1,000,000
Total	$242,810,000

The number of person-years involved in the above programs is unavailable.

4. OBSERVATIONS

Each of the selected foreign countries has one or more central agencies dedicated to the continuing financial support of library and information networking programs. Their funds can, therefore, be disbursed according to agreed policies, practical requirements and priorities. In Britain, for example, this is achieved through the British Library Research and Development Department acting on the advice of multi-level consultation arrangements.

In the European countries covered in this appendix, the funding agencies also have responsibility for the development of a formal conceptual framework to describe their national networks. West Germany is the best example among the above. It has not only developed and obtained agreement on a conceptual schema for its national network but has succeeded in implementing many of the information services defined in its network concept. On a larger scale, the Commission of the European Communities has succeeded in obtaining the agreement and support of its nine member states in the implementation of a European on-line information network (EURONET).